SECRETS FROM TOP TUNERS

HIGH PERFORMANCE HOW-TO

M420

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HARLEY-DAVIDSON

74 & 80 4-SPEED V-TWINS · 1959-1984

SERVICE · REPAIR · PERFORMANCE

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1200

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HARLEY-DAVIDSON

74 & 80 4-SPEED V-TWINS • 1959-1984
SERVICE • REPAIR • PERFORMANCE

By
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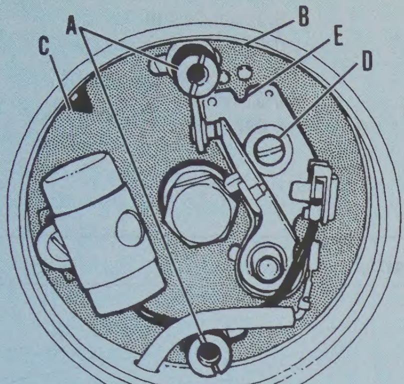
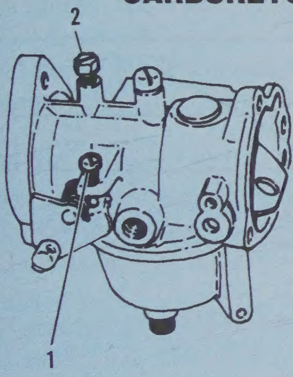


BREAKER PLATE ASSEMBLY
1959-1977

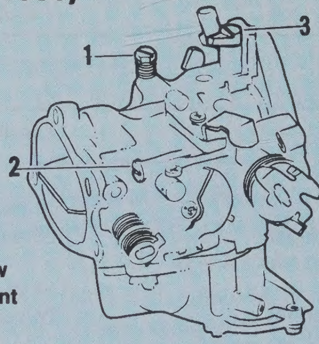
A. Timing plate screws
B. Timing plate
C. Pry notch for timing
D. Breaker point lock screw
E. Pry notch for point gap

BENDIX CARBURETOR



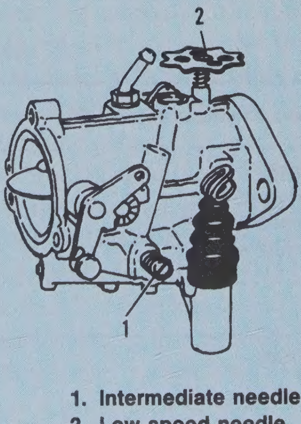
1. Idle speed screw
2. Low speed needle

KEIHIN CARBURETOR (1976-1980)



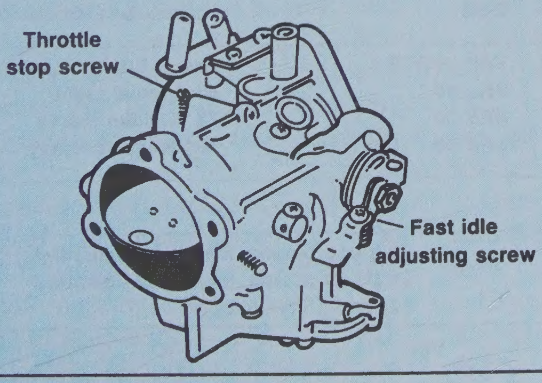
1. Throttle stop screw
2. Fast idle adjustment (1978-1980)
3. Low speed mixture screw (1976-1979)

H-D CARBURETOR



1. Intermediate needle
2. Low speed needle

KEIHIN CARBURETOR (1981-ON)


Throttle stop screw
Fast idle adjusting screw

TUNE-UP SPECIFICATIONS

Spark plugs	Harley-Davidson No.	Gap
1980 and later	No. 5R-6A or 5RL	0.038-0.043 in.
(resistor type)	5-RL	0.038-0.043 in.
1978-1979	No. 5A6A	0.038-0.043 in.
(resistor type)	5R-6A	0.038-0.043 in.
1975-1977	No. 5-6	0.028-0.032 in.
1959-1974	No. 3-4	0.028-0.032 in.
Breaker point gap		
1978 and later	Not applicable	
1976-1977	0.018 in.	

Carburetor adjustments

Keihin	
Idle speed	
Late 1978-on	900 rpm
1976-early 1978	700-900 rpm
Fast idle	
Late 1978 on	1,500 rpm
Mixture screw	
1980 and later	Not adjustable
Late 1978-1979	
74 cu. in.	1-1/8 turn out
80 cu. in.	3/4 turn out
1976-early 1978	7/8 turn out, then set for smoothest idle

TIRE PRESSURES

	Front	Rear
FL Series		
Solo	20 psi	24 psi
With passenger	20 psi	26 psi
FX Series (except FXWG)		
Solo	24 psi	26 psi
With passenger	26 psi	28 psi
FXWG		
Solo	30 psi	26 psi
With passenger	30 psi	28 psi

CAUTION: Maximum pressure for all tires is 36 psi.
NOTE: These pressures are based on 150 lb. rider weight. For each extra 50 lb., add 2 psi at rear, 1 psi at front.

RECOMMENDED FUEL AND OIL

Engine and Transmission Oil	SAE	Harley-Davidson
20-90 degrees F	SAE 20W50	Power Blend Super Premium
Below 40 degrees F	SAE 40	58 Special Light
40-90 degrees F	SAE 50	75 Medium Heavy
Above 90 degrees F	SAE 60	105 Regular Heavy

Gasoline	
1981 and later	89 pump octane, leaded or unleaded
1980	94 pump octane, leaded or unleaded
1959-1979	Leaded premium only

CHAPTER ONE

GENERAL INFORMATION

This manual provides service and repair procedures for Harley-Davidson 74 cu. in. (1200 cc) and 80 cu. in. (1340 cc) motorcycles built since 1959. In addition, much of this information is directly applicable to models as early as 1941.

The main body of this book (Chapters One through Nine) contains service information for 1959 through 1975 motorcycles. The final section is a supplement for 1976 and later bikes.

If you have a 1976 or later model, first go to the applicable part of the supplement at the end of this book. If a procedure does not appear in the Supplement, then it remains the same as for early models.

SERVICE HINTS

Most service procedures described in this book are straightforward, and can be performed by anyone reasonably handy with tools. It is suggested, however, that you consider your own capabilities carefully before attempting any operation involving major engine disassembly and repair.

Some operations, for example, require the use of an arbor press, or special Harley-Davidson service tools. It would be wiser to have those operations performed by a shop equipped for such work, rather than to try to do the job yourself with makeshift equipment. Other procedures require precision measurements. Unless you have the skills and equipment required, it would be better to have a qualified shop make those measurements.

You will find that repairs will go much faster and easier if your machine is clean before beginning work. There are special cleaners for washing the engine and related parts. Just brush or spray on the cleaning solution, let it stand, then rinse it away with a garden hose. Clean all oily or greasy parts with cleaning solvent as they are removed. *Never use gasoline as a cleaning solvent.* Gasoline presents an extreme fire hazard. Be sure to work in a well ventilated area when you use cleaning solvent. Keep a fire extinguisher, rated for gasoline fires, handy just in case.

Special tools are required for some service procedures. Some of them may be improvised; others, such as bearing lapping tools, are available at Harley-Davidson dealers.

Much of the labor charge for repairs made by dealers is for removal and disassembly of other parts to reach the defective one. It is frequently possible to do all of this yourself, then take the affected subassembly into the dealer for repair.

Once you decide to tackle the job yourself, read the entire section in this manual which pertains to it. Study the illustrations and the text until you have a good idea of what is involved. If special tools are required, make arrangements to get them before starting work. It's frustrating to get partly into a job and then be unable to complete it.

Throughout this book are separate NOTES, CAUTIONS, and WARNINGS, set in italics. A NOTE is intended to clarify a point or procedure. A CAUTION, if ignored, may result in damage to the motorcycle. A WARNING, if ignored, may result in serious or even fatal injury.

TOOLS

Every motorcyclist should carry a small tool kit with him or her, to help make minor roadside adjustments and repairs. A suggested kit is shown in **Figure 1**.

An assortment of ordinary hand tools is also required. As a minimum, have the following available.

1. Combination wrenches
2. Socket wrenches
3. Assorted screwdrivers
4. Assorted pliers
5. Plastic mallet
6. Small hammer

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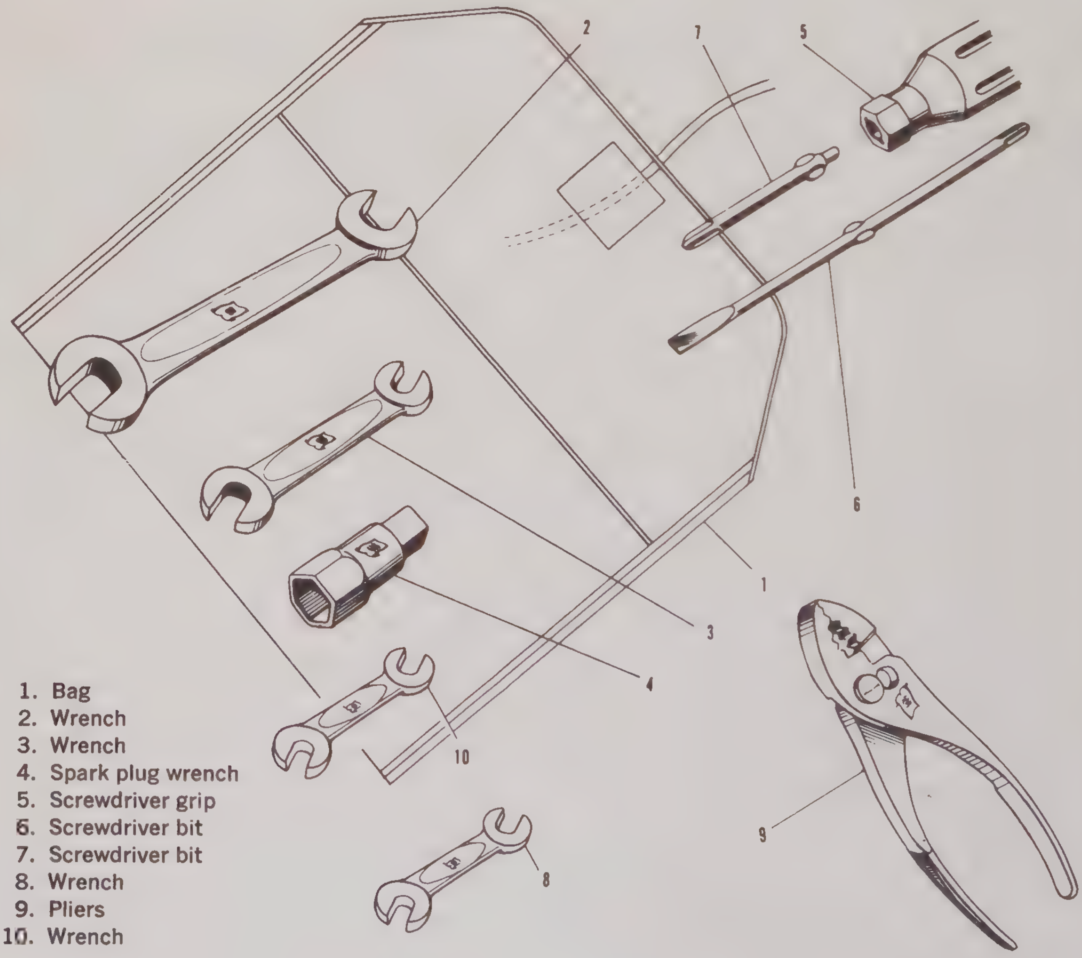
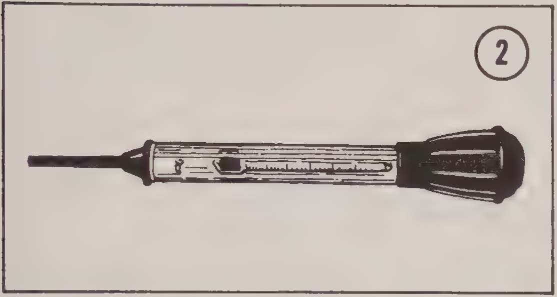
TYPICAL TOOL KIT



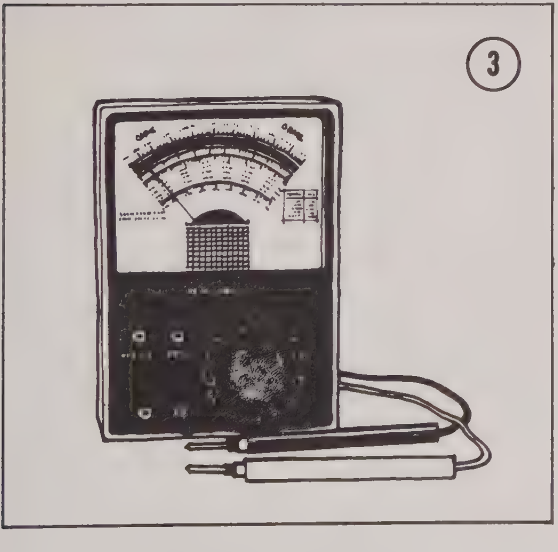
1. Bag
2. Wrench
3. Wrench
4. Spark plug wrench
5. Screwdriver grip
6. Screwdriver bit
7. Screwdriver bit
8. Wrench
9. Pliers
10. Wrench

Tune-up and troubleshooting procedures require a few more tools.

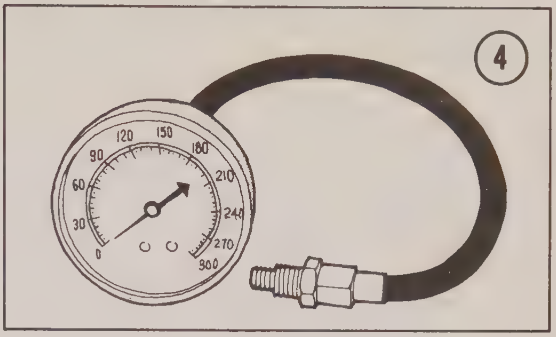
1. *Hydrometer* (**Figure 2**). This instrument measures state of charge of the battery, and tells much about battery condition. Such an instrument is available at any auto parts store and through most larger mail order outlets.



2. *Multimeter*, or *VOM* (**Figure 3**). This instrument is invaluable for electrical system troubleshooting. A few of its functions may be duplicated by locally fabricated substitutes, but for the serious hobbyist it is a must. Multimeters are available at electronics hobbyist stores and mail order outlets.

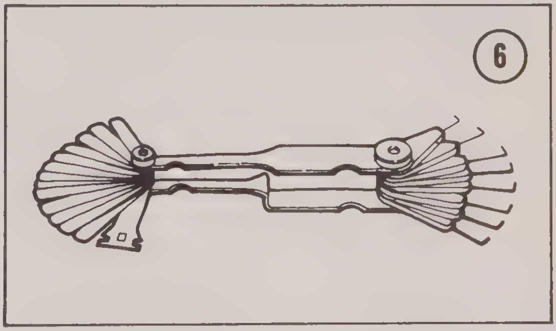


3. *Compression gauge* (**Figure 4**). An engine with low compression cannot be properly tuned and will not develop full power. This instrument measures cylinder compression pressure. Gauges are available at auto accessory stores.



4. *Timing light* (**Figure 5**). It is possible to adjust ignition timing statically, but it is more difficult and not as accurate as when a timing light is used.

5. *Ignition gauge* (**Figure 6**). This tool measures breaker point gap with its flat feeler gauges. It also has round wire gauges for measuring spark plug gap.



6. *Impact driver* (**Figure 7**). This tool might have been designed with the motorcyclist in mind. It makes removal of tight screws, such as those which retain engine covers, easy and eliminates damaged screw slots. Good ones are available at better hardware stores.

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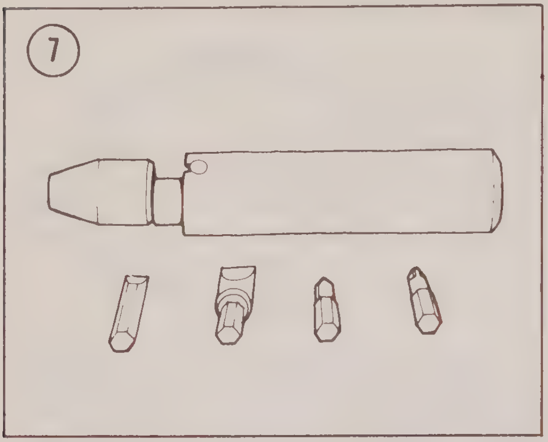

EXPENDABLE SUPPLIES

Certain expendable supplies are also required. These include grease, oil, gasket cement, wiping rags, cleaning solvent, and distilled water. Cleaning solvent is available at many service stations. Distilled water, required for the battery, is available at every supermarket. It is sold for use in steam irons, and is inexpensive.

SAFETY FIRST

Professional motorcycle mechanics can work for years and never sustain a serious injury. If you observe a few rules of common sense and safety, you can enjoy many safe hours servicing your own machine. You can also hurt yourself or damage the machine if you ignore these rules.

1. Never use gasoline as a cleaning solvent.
2. Never smoke or use a torch in the area of flammable liquids, such as cleaning solvent in open containers.
3. Never smoke or use a torch in an area where batteries are charging. Highly explosive hydrogen gas is formed during the charging process.
4. If welding or brazing is required on the machine, remove the fuel tank to a safe distance, at least 50 feet away.
5. Be sure to use the proper size wrenches for nut turning.
6. If a nut is tight, think for a moment what would happen to your hand should the wrench slip. Be guided accordingly.
7. Keep your work area clean and uncluttered.
8. Wear safety goggles in all operations involving drilling, grinding, or use of a chisel.
9. Do not use worn tools.
10. Keep a fire extinguisher handy. Be sure that it is rated for gasoline and electrical fires.
11. Except for those parts which must be pressed in or out, all parts should disassemble or assemble easily. If they do not, stop and recheck your work to find out the reason.

NOTE: If you own a 1976 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER TWO

PERIODIC MAINTENANCE

To gain the utmost in safety, reliability, and performance from your motorcycle, it is necessary to perform periodic inspections, adjustments, and maintenance procedures. It frequently happens that minor problems found during such inspections are simple and inexpensive to correct at the time, but could lead to major failures later. This chapter describes such services.

This manual covers both emission-controlled motorcycles manufactured after January 1, 1978, and non-controlled motorcycles built before that date. If you have an emission-controlled bike, refer to the Supplement at the end of this book for additional tune-up information. If a procedure does not appear in the Supplement, then it remains the same as described in this chapter.

Table 1 is a suggested maintenance schedule. Note that under more severe riding conditions some maintenance items may require attention more frequently.

ENGINE TUNE-UP

The following list summarizes tune-up procedures for non-emission controlled motorcycles built before January 1, 1978. Detailed instructions follow the list. Check the engine carefully, and proceed systematically. Consult Chapter Eight for troubleshooting procedures when you suspect more serious trouble. Refer to **Table 2** for tune-up specifications.

1. Inspect the air filter and clean it or install a new one.
2. Clean the fuel valve filter screen. Inspect the fuel lines for cracks or leakage.

Table 1 MAINTENANCE SCHEDULE — 1959 TO EARLY 1978

Maintenance Items	500 Miles	1,000 Miles	2,000 Miles	5,000 Miles
Check battery	X			
Check tires	X			
Adjust chain	X			
Adjust clutch	X			
Adjust brakes	X			
Tighten fasteners	X			
Check wheels	X			
Check chain oiler		X		
Change engine oil		X		
Engine tune-up			X	
Adjust primary chain			X	
Replace oil filter				X
Change transmission oil				X
Check generator				X
Check shock absorber				X
Check suspension bearings				X

Table 2 TUNE-UP SPECIFICATIONS

Spark plugs	**Harley-Davidson No.**	**Gap**
1975	No. 5-6	0.028-0.032 in.
1959-1974	No. 3-4	0.028-0.032 in.
Breaker point gap		
1971-1975	0.018 in.	
1959-1970	0.020 in.	
Carburetor adjustments		
Model HD		
Idle speed	900-1,100 rpm	
Intermediate needle	7/8 turn out; set idle @ 2,000 rpm adjust for highest rpm without misfire or surge; turn out 1/8 turn; reset idle.	
Low speed needle	7/8 turns out, then set for smoothest idle, alternating between idle screw and low speed needle.	
Bendix 16P12		
Idle speed	700-800 rpm	
Mixture screw	1-1/2 turns out, then set for smoothest idle	

3. Inspect the spark plugs and adjust the gap or replace them if necessary.
4. Check and record cylinder compression.
5. Inspect the contact breaker points and adjust the gap or replace the points if necessary. Lubricate the point cam wick very lightly.
6. Inspect the ignition timing and adjust if necessary.
7. Adjust the carburetor if required.

Spark Plugs

As the first step in any tune-up, remove and examine both spark plugs. Be sure to note which cylinder each spark plug came from, because spark plugs can tell much about engine condition and carburetion.

To remove a spark plug, first clean the area around its base to prevent dirt or other foreign material from entering the cylinder. Then unscrew the spark plug, using a suitable deep socket. If difficulty is encountered removing a plug, apply penetrating oil to its base and allow some 20 minutes for the oil to work in. It may also be helpful to rap the cylinder head lightly with a rubber or plastic mallet. This procedure sets up vibrations which help the penetrating oil to work in. Be careful not to break any cooling fins when tapping the cylinder head.

Figure 1 illustrates various conditions which might be encountered upon spark plug removal.

Normal Use—If plugs have a light tan or gray colored deposit and no abnormal gap wear or erosion, good engine condition, carburetion, and ignition condition are indicated. The plug in use is of the proper heat range, and may be serviced and returned to use.

Carbon Fouled—Soft, dry, sooty deposits are evidence of incomplete combustion and can usually be attributed to rich carburetion. This condition is also sometimes caused by weak ignition, retarded timing, or low compression. Such a plug may usually be cleaned and returned to service, but the condition which causes fouling should be corrected.

Oil Fouled—This plug exhibits a black insulator tip, damp oily film over the firing end, and a carbon layer over the entire nose. Electrodes will not be worn. Common causes for this condition are worn piston rings or valve guides, or possibly the plugs in use are too cold. Oil fouled spark plugs may be cleaned in a pinch, but it is better to replace them. It is

SPARK PLUG CONDITIONS

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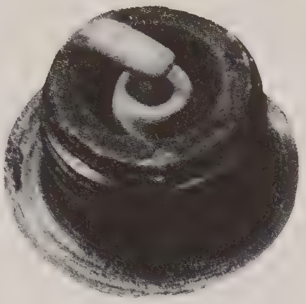
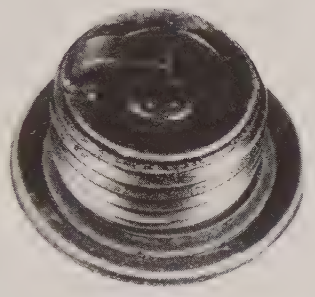
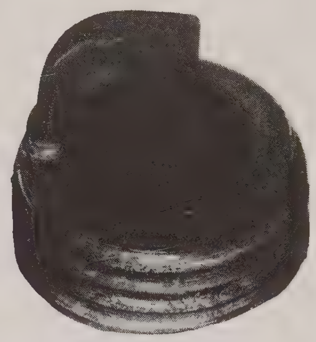


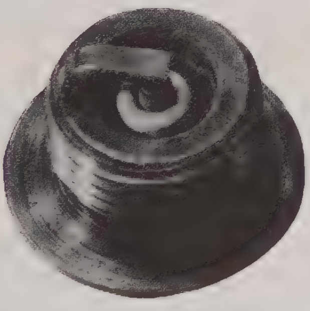
NORMAL USE



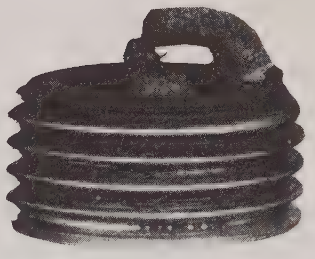
OIL FOULED



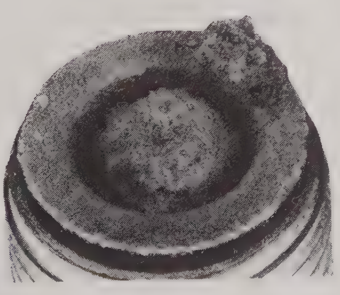
CARBON FOULED



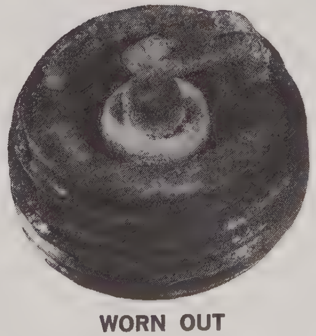
OVERHEATED



GAP BRIDGED



SUSTAINED PREIGNITION



WORN OUT

Photos courtesy of Champion Spark Plug Company.

important to correct the cause of fouling before the engine is returned to service.

Gap Bridging—Plugs with this condition exhibit gaps shorted out by combustion chamber deposits fused between electrodes. On 4-stroke engines, the usual cause is poor oil control resulting from worn piston rings or valve guides. Be sure to locate and correct the cause of this spark plug condition. Such plugs must be replaced with new ones.

Overheated—Overheated spark plugs exhibit burned electrodes. The insulator tip will be light gray or even chalk white. The most common cause for this condition is using a spark plug of the wrong heat range (too hot). If it is known that the correct plug is used, other causes are lean fuel mixture, engine overloading or lugging, loose carburetor mounting, or timing advanced too far. Always correct the fault before putting the bike back into service. Such plugs cannot be salvaged; replace with new ones.

Worn out—Corrosive gases formed by combustion and high voltage sparks have eroded the electrodes. Spark plugs in this condition require more voltage to fire under hard acceleration; often more than the ignition system can supply. Replace them with new spark plugs of the same heat range.

Preignition—If electrodes are melted, preignition is almost certainly the cause. Check for carburetion mounting or intake manifold leaks, also overadvanced ignition timing. It is also possible that a plug of the wrong heat range (too hot) is being used. Find the cause of preignition before putting the engine back into service.

Spark plugs may usually be cleaned and regapped, which will restore them to near new condition. Since the effort involved is considerable, such service may not be worth it since new spark plugs are relatively inexpensive.

For those who wish to service used plugs, the following procedure is recommended.

1. Clean all oily deposits from the spark plug with cleaning solvent, then blow dry with compressed air. If this precaution is not taken, oily deposits will cause gumming or caking of the sandblast cleaner.
2. Place the spark plug in a sandblast cleaner and blast 3 to 5 seconds, then turn on air only to remove particles from the plug.
3. Repeat Step 2 as required until the plug is cleaned. Prolonged sandblasting will erode the insulator and make the plug much more susceptible to fouling.
4. Bend the side electrode up slightly, then file the center electrode so that it is no longer rounded, and the side electrode so that its edges are not rounded. The reason for this step is that less voltage is required to jump between sharp corners than between rounded edges.
5. Adjust spark plug gap as specified in **Table 2**. Always use a round wire gauge (**Figure 2**) for measurement. Never try to bend the center electrode to adjust the gap; you may crack the porcelain insulator. Bend the side electrode (**Figure 3**).

Valve Adjustment

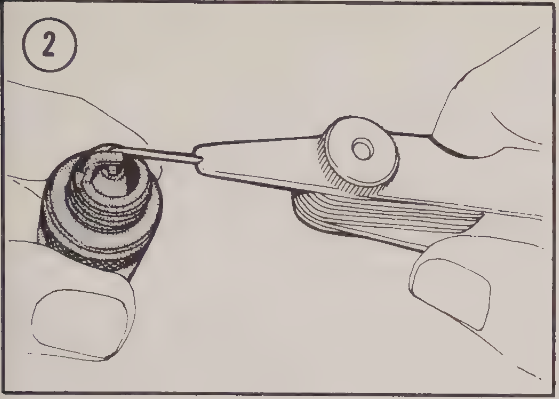
Once properly assembled, the hydraulic valve lifters maintain zero valve clearance while running, eliminating the need for periodic valve adjustment. Some valve clatter should be expected when starting the engine, until the hydraulic lifters pump up. If you want to verify proper assembly, refer to *Pushrod Adjustment* in Chapter Three.

Cylinder Compression

A cylinder cranking compression check is not *required maintenance*, but it is the quickest way to check the internal condition of the engine: rings, valves, head gasket, etc. It's a good idea to check compression at each tune-up, write it down and compare it with the reading you get at the next tune-up. This will help you spot any developing problems before they cost too much repair money.

1. Ride the bike to warm it up fully. Make sure the choke is OFF.
2. Remove the spark plugs.
3. Insert the tip of a compression gauge into the spark plug hole, making sure it seals fully (**Figure 4**).
4. Turn the kill switch off, hold the throttle wide open and crank the engine several revolutions until the gauge gives its highest

2



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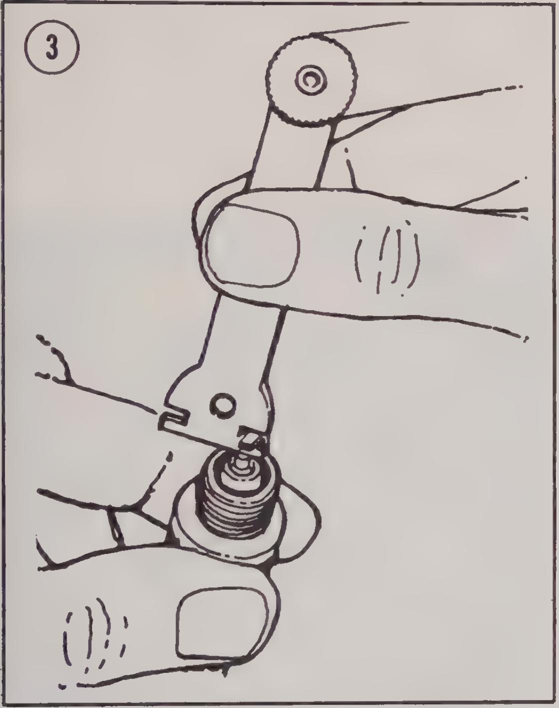

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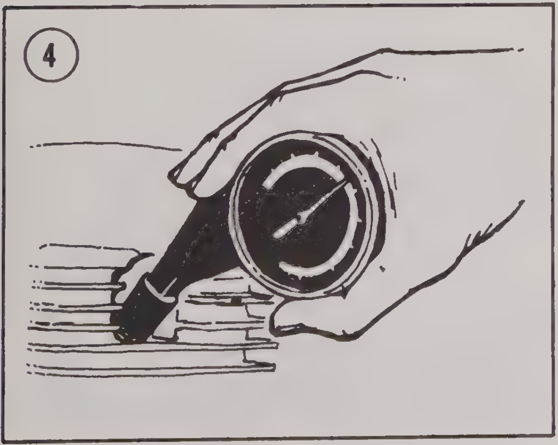

reading. Record the number and repeat for the other cylinder.

When interpreting the results, the actual reading is not as important as the difference from the last check and the difference between cylinders. Individual gauge calibrations vary widely. A significant drop (more than 10 psi) since the last check (made with the same gauge) may indicate engine top end problems.

If the compression is 90-100 psi or more and there is less than a 10 psi difference between cylinders, compression is normal. If either cylinder reads less than about 90 psi, check your readings with a recently calibrated gauge. It may be time to rebuild the top end (rings and valves).

To tell the source of a problem, pour about a teaspoon of motor oil into the spark plug hole. Turn the engine over once to distribute the oil, then take another compression reading. If the compression returns to normal, the valves are good, but the rings are worn. If compression does not increase, the valves may be damaged.

Breaker Points

Normal use of a motorcycle causes breaker points to burn and pit gradually. If they are not too pitted, they can be dressed with a few strokes of a clean point file. Do not use emery cloth or sandpaper, because particles can remain on the points and cause arcing and burning. If a few strokes of the file do not smooth the points completely, replace them.

Oil or dirt may get on the points, resulting in premature failure. Common causes for this condition are improper breaker cam lubrication or lack of care when the breaker point cover is removed.

Points should be cleaned and regapped every 1,500-2,000 miles. To clean the points, dress them lightly with a point file, then remove all residue with lacquer thinner. Close the points on a piece of clean white paper, such as a business card. Continue to pull the card through the closed points until no discoloration or residue remains on the card. Finally, rotate the engine and observe the points as they open and close. If they do not meet squarely, replace them.

Note that a gray frosted appearance is normal for points which have been in service for a long time, and is not cause in itself for replacement. Obvious transfer of metal from one contact to the other is cause for immediate replacement.

To replace points, first refer to **Figure 5**. Although that illustration shows breaker points on 1970 and later models, earlier models should present no difficulty.

1. Remove both wires from terminal (A).
2. Remove stationary contact screw (B).
3. Pull off moving contact (C) and stationary contact (D) as an assembly.
4. Clean breaker cam (E) thoroughly, then apply a small quantity of breaker cam lubricant. Don't put on too much; a light film on the cam is all that is required. Breaker cam lubricant is available at any auto parts store.
5. Reverse steps 1 through 3 to install new points. Be very careful that no oil or grease gets on them.
6. Adjust point gap, then ignition timing.

After breaker points are installed, and at approximately 2,000-mile intervals during their service life, they must be adjusted. To do so, refer to **Figure 6**, then proceed as follows.

1. With spark plugs removed, place transmission in high gear, then rotate rear wheel until points are open fully and breaker point rubbing block is on wide cam lobe.

2. Check gap between breaker points. Point gap should be 0.020 in. for 1970 and earlier models, and 0.018 in. for 1971 and later models. If adjustment is required, go on with Steps 3-5.

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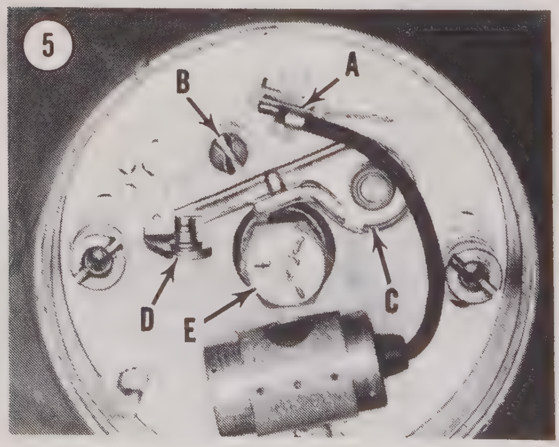


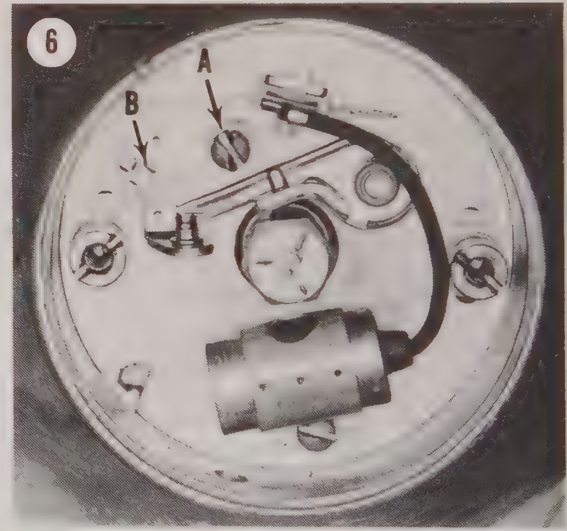
3. Loosen screw (A) slightly, then move stationary contact with a screwdriver in pry slots (B) as required.

4. Tighten screw (A), then recheck gap. Readjust if necessary.

5. Turn engine over until points are fully open again, and rubbing block is on narrrow cam lobe. Recheck gap. If point gap differs by more than 0.004 in., the point cam is tracking eccentrically. Loosen the center bolt that holds the cam, and move the cam as required to equalize the point gap at both cam lobes. Tighten the bolt.

6. Adjust ignition timing.

6



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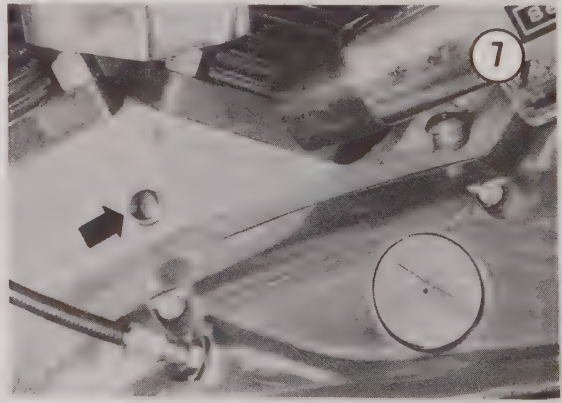
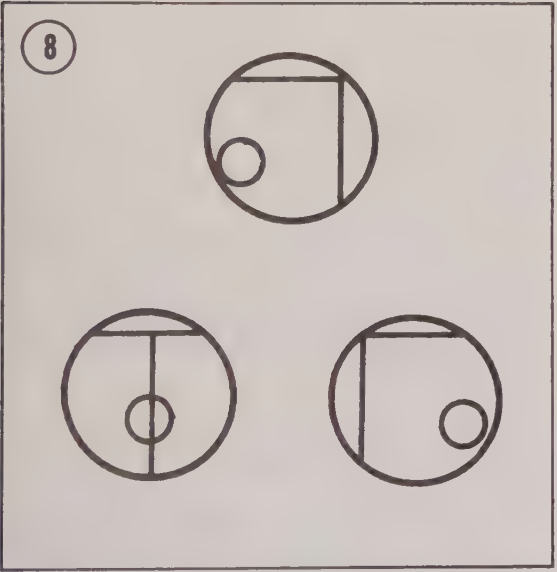


Ignition Timing, Single Points

1. Connect a strobe-type timing light, following its manufacturer's instructions. Its trigger lead should be connected to the front cylinder spark plug.
2. Remove the timing inspection plug, then install a clear plastic timing hole plug to prevent oil splash.
3. Start the engine and run it at 2,000 rpm.
4. Direct the timing light at the timing inspection hole (**Figure 7**). The timing light "stops" the vertical bar each time the front cylinder fires, and the dot each time the rear cylinder fires. **Figure 8** illustrates acceptable timing patterns.

8



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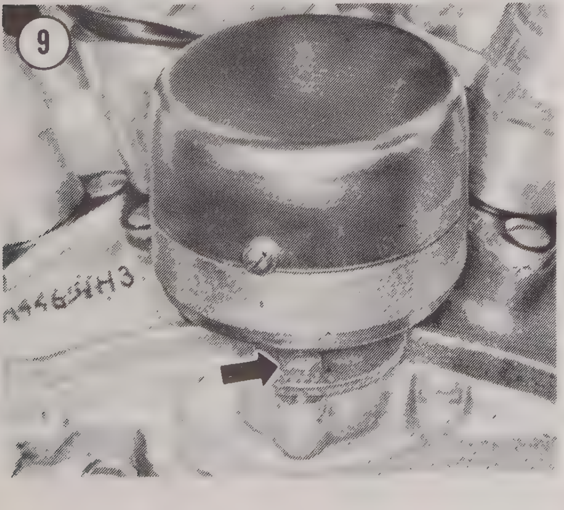
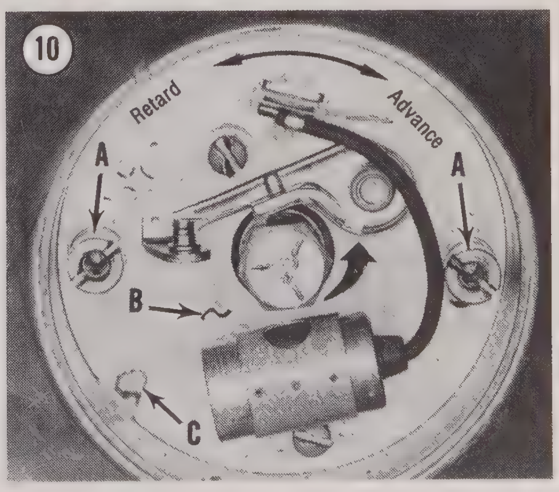


5. If adjustment is required on 1970 and earlier models, refer to **Figure 9**. Slightly loosen circuit breaker clamp, then rotate entire circuit breaker housing as required until timing pattern is acceptable. Be sure to tighten clamp.
6. To adjust timing on 1971 and later models, refer to **Figure 10**. Slightly loosen both timing plate screws (A), then turn timing plate (B) as required, using a screwdriver in notch (C). Be sure to tighten both timing plate screws.

Ignition Timing, Dual Point Models

1. Connect a strobe-type timing light, following its manufacturer's instructions. Connect the trigger lead to the front cylinder.
2. Screw a clear plastic plug into the timing inspection hole.
3. Start engine and run it at 2,000 rpm.
4. Direct the timing light at the timing inspection hole. A vertical line should appear centered in the hole. If OK, go on to Step 9. If adjustment is required, continue with Steps 5 through 11.
5. Loosen the contact breaker housing clamp screw, then rotate the entire housing as required until the front cylinder timing mark is centered in the inspection hole.
6. Tighten the clamp screw, then recheck front cylinder timing.
7. Stop the engine, then connect the timing light trigger terminal to the rear cylinder.

10



8. Start the engine, then run it at 2,000 rpm.
9. Direct the timing light at the inspection hole. The rear cylinder timing mark should appear centered in the hole. If OK, no further adjustment is required. Continue with Steps 10 and 11 if adjustment is required.
10. Adjust rear cylinder timing by varying rear cylinder point gap. If timing is advanced, move them together slightly, and if retarded, move them apart slightly.

NOTE
This adjustment will result in a different point gap setting. This condition is normal.

11. Again check rear cylinder timing and readjust as required.

Air Cleaner Service

As part of any tune-up, air cleaner elements should be cleaned or replaced as required. A clogged air cleaner results in an overrich mixture, causing power loss and poor gas mileage. Be sure that the air cleaner element is not torn and that it fits so that no dirt can leak past its edges.

Clean metal mesh air cleaner elements in solvent, then saturate with engine oil. Allow excess oil to drain before installation. In extremely dusty conditions, this should be done every 100 miles.

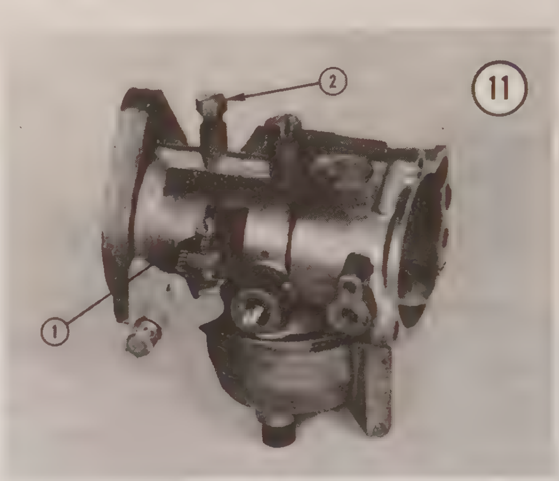
Wash foam plastic filter elements in detergent solution and water. Allow to dry thoroughly, then saturate with engine oil. Work oil in until color is uniform. Drain excess oil, then replace element on screen so that 3 grooves are toward screen, then install on engine. Replace the element if it is torn or punctured.

Fuel Strainer

Remove and clean the fuel strainer element. Be sure that the fuel petcock does not leak. Dirty fuel strainers are a major cause of carburetor flooding.

Carburetor Adjustment

Carburetor adjustment is left as the last step to be done on the engine, because it cannot be done accurately unless all other adjustments are correct.



1. Idle speed screw
2. Low speed needle

Carburetors must also be adjusted with the engine thoroughly warm, while most other adjustments must be or are more easily done with the engine cold.

Normally, the only carburetor adjustments that are done during the time of engine tune-up are idle speed and idle mixture. If other adjustments seem to be required, refer to Chapter Five.

Bendix 16P12 Carburetor

Refer to **Figure 11**, then proceed as follows.
1. Turn low speed needle fully clockwise until it seats lightly, then back it out 1-1/2 turns.
2. Start engine and warm it thoroughly.
3. Adjust idle speed screw so that engine runs at 700-800 rpm with throttle fully closed.

CAUTION
Never adjust engine idle to slowest possible speed. Very slow idle speed results in bearing wear, oil consumption, and poor acceleration from low speed.

4. Adjust low speed needle as required to make engine accelerate and run more smoothly at idle.
5. Make final adjustment of idle speed screw, if required, to obtain 700-800 rpm idle.

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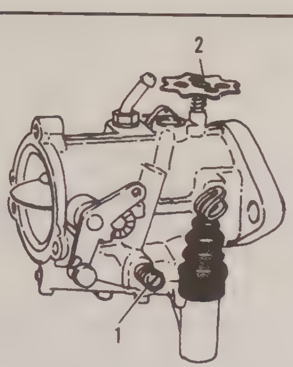

1. Intermediate needle 2. Low speed needle

Model HD Carburetor

Refer to **Figure 12**, then proceed as follows.

1. Make sure that throttle wire from handlebar grip fully closes throttle lever on carburetor.
2. Turn low speed needle clockwise until it seats lightly, then back it out about 7/8 turn.
3. Turn intermediate needle in until it seats lightly, then back it out 7/8 turn also.
4. Start engine and warm it thoroughly.
5. Adjust idle speed screw so that engine runs at approximately 2,000 rpm.
6. Slowly turn intermediate needle in the direction in which produces the highest engine speed without missing or surging. Then turn intermediate needle counterclockwise 1/8 turn from that point.
intermediate needle counterclockwise 1/8 turn from that point.
7. Back off idle speed screw until engine idles at 900-1,100 rpm.
8. Alternately adjust the low speed needle and the idle speed screw to produce a smooth idle at 900-1,100 rpm.

Keihin Carburetor

Refer to the supplement at the back of this book.

BATTERY SERVICE

The battery should be checked at every tune-up. Complete information is contained in Chapter Six. Briefly, the following items should be attended to regularly.

1. Test state of charge. Recharge if at half charge (1.220 specific gravity) or less.
2. Add distilled water if required.
3. Clean battery top.
4. Clean and tighten terminals.

OIL AND OIL FILTER

Probably the single most important maintenance item which contributes to long engine life is that of regular oil changes. Engine oil becomes contaminated with products of combustion, condensation, and dirt. Some of these contaminants react with oil, forming acids which attack vital engine components, and thereby result in premature wear.

Figure 13 illustrates a typical oil filter and oil tank cap. Remove cap and check oil level at least every 250 miles. Tank capacity is 4 U.S. quarts. Do not fill above FULL mark on dipstick. Add 2 quarts when oil level is down to REFILL mark. **Table 3** lists proper oil grade.

After a new or overhauled engine has been operated its first 500 and 1,000 miles, completely drain oil tank and refill with fresh engine oil. Flush oil tank with kerosene at the first oil change, and at every second change thereafter. Oil should be hot when it is drained.

Thoroughly clean the oil filter element in solvent every 2,000 miles, and replace it every 5,000 miles.

CLUTCH ADJUSTMENT

Adjust the clutch at 1,000-mile (1,500-kilometer) intervals, or more often if required. Complete clutch adjustment procedures are discussed in Chapter Four.

ELECTRICAL EQUIPMENT

Check all electrical equipment for proper operation—lights, horn, starter, etc. Refer to Chapter Six for electrical system service.

DRIVE CHAIN

Clean, lubricate, and adjust the drive chain every 1,000 miles, following the instructions in Chapter Seven. Upon installation, adjust

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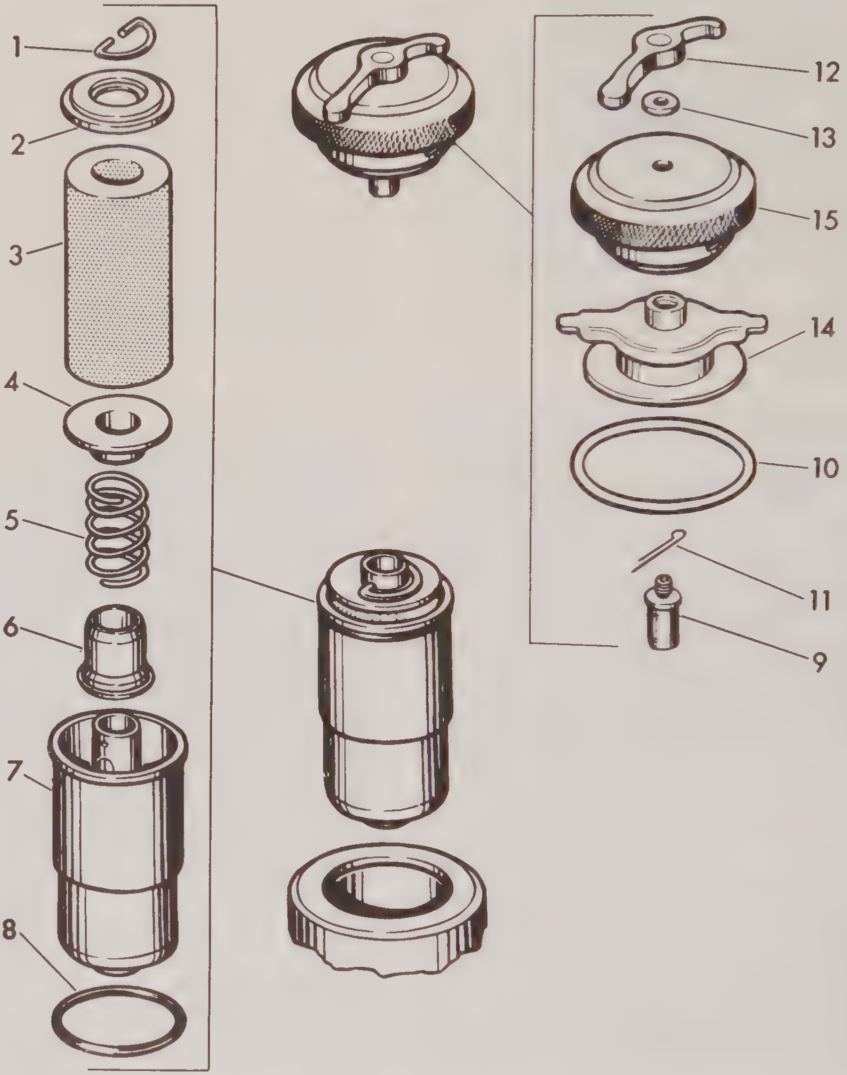
OIL FILTER AND OIL TANK CAP



1. Filter clip
2. Cap seal washer
3. Filter element
4. Filter lower retainer
5. Cup spring
6. Cup seal
7. Cup
8. O-ring
9. Valve assembly
10. Cap gasket
11. Cap cotter pin
12. Cap screw
13. Cap washer
14. Cap nut
15. Cap top

drive chain tension to provide 1/2 in. up-and-down play when drive chain is at its tightest.

PRIMARY CHAIN

Check the primary chain slack every 2,000 miles. See *Primary Chain* in Chapter Four.

Table 3 OIL GRADE

Air Temperature	SAE Grade
Below 40°F	40
Above 40°F	50
Severe operation at high temperature	60

BRAKES

Adjust front and rear brakes every 1,000 miles, or more often as needed, following the instructions in Chapter Seven. Remove wheels and check brake lining at 6,000-mile intervals. Disc brakes do not require adjustment. Check wheel bearings at the same time.

WHEELS AND TIRES

Check wheels for bent rims and loose or missing spokes. Complete wheel inspection and service procedures are detailed in Chapter Seven. **Table 4** lists proper tire pressures. Always measure pressure with tires cold.

Table 4 TIRE PRESSURES — PSI*

Model	Solo	With Passenger
FL Series:		
Front	20	20
Rear	24	26
FX Series:		
Front	24	24
Rear	26	28

*These pressures based on 150 lb. rider weight. For each additional 50 lb., add 2 psi at rear and 1 psi at front.

CAUTION: Maximum cold pressure is 32 psi

NOTE: If you own a 1976 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER THREE

ENGINE

Harley-Davidson motorcycles are equipped with air-cooled, 4-cycle, V-twin engines. Valves are operated by pushrods and rocker arms. Engine displacement is 74 cu. in.

Both cylinders fire once in 720 degrees of crankshaft rotation. The rear cylinder fires 315 degrees after the front cylinder. The front cylinder fires again in another 405 degrees. Note that one cylinder is always on its exhaust stroke when the other fires on its compression stroke.

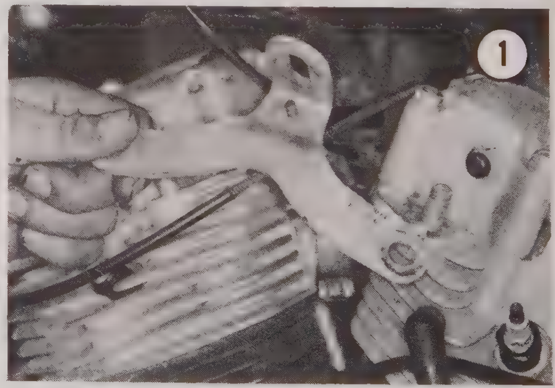
PREPARATION FOR ENGINE DISASSEMBLY

Some service operations can be performed without engine removal. Engine upper end components (cylinder heads, pistons, and cylinders) may be serviced without engine removal. Gearcase components may also be serviced with the engine in place.

1. Thoroughly clean the engine exterior of dirt, oil, and foreign material, using one of the cleaners formulated for the purpose.
2. Be sure that you have proper tools for the job. See the general information in Chapter One.
3. As you remove parts from the engine, place them in trays in the order of their disassembly. Doing so will make reassembly faster and easier, and will ensure correct installation of all engine parts.

If only upper end components are to be serviced, proceed only with Steps 1 through 9.

1. Remove instrument panel cover and pry off cover side plate.
2. Remove seat.
3. Drain all fuel, then remove tanks. On models with hand shift, remove shift lever lower bolts so that the shift lever may be removed with the left tank.
4. Remove cylinder head bracket (**Figure 1**). Note location of washers and frame lug, so that they may be installed correctly.



5. Remove spark plugs.
6. Disconnect ground cable at battery.
7. Disconnect intake manifold clamps.

8. Remove entire air cleaner assembly from carburetor.

9. Remove carburetor.

At this point, cylinder heads, cylinders, and pistons may be removed and serviced. If engine is to be removed completely, continue with Steps 10 through 30.

10. Remove left footrest and primary chain cover. Place a suitable pan underneath to catch oil as it drains.

11. Remove compensating sprocket nut or engine sprocket nut (**Figure 2**).

12. On 1965 and later models, remove chain adjuster bolt (**Figure 3**) and brass starter shaft thrust washer.

13. Remove nut on center screw of clutch sprocket. Slip a 1¾ in. washer over adjusting screw, then replace nut. Remove 3 spring tension adjusting nuts, then pull clutch outer disc and spring collar from clutch hub drive pins.

14. Remove clutch discs and plates (**Figure 4**).

15. Remove engine sprocket, primary chain, and clutch shell as a unit (**Figure 5**).

NOTE
On 1970 and later models, note the number and thickness of spacers between the alternator rotor hub and the splined shaft extension. Be sure to install them exactly as removed.

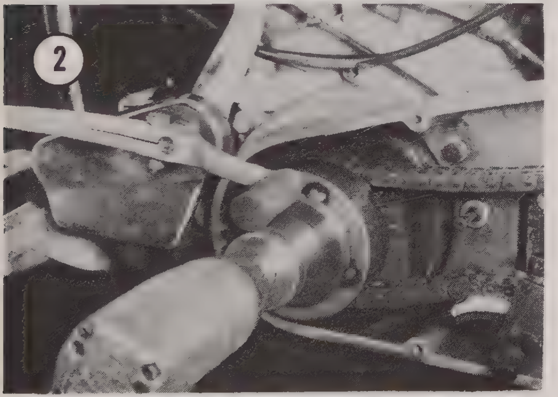
16. Remove 3 bolts which attach engine to primary chain cover (**Figure 6**).

17. On 1965 and later models, loosen 5 transmission base nuts. Remove 4 bolts which secure transmission to primary chain cover.

18. Remove clutch hub (**Figure 7**), using a suitable puller, after removing clutch hub nut. Remove shaft key. Note that this nut has a left-hand thread.

19. Remove nuts which attach starter housing to inner primary chain cover.

2



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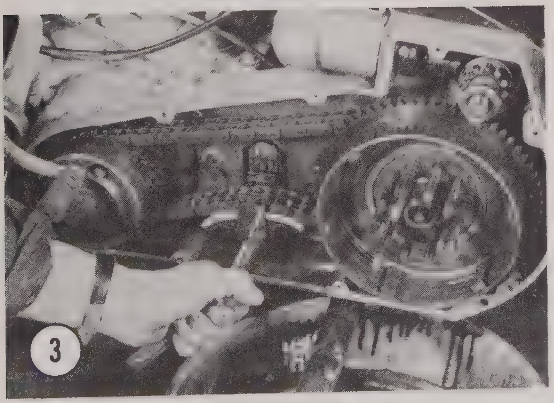

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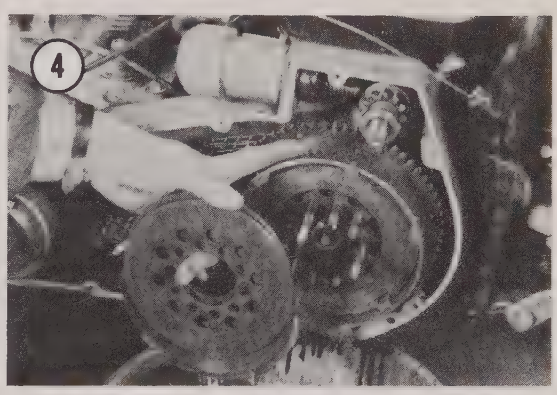

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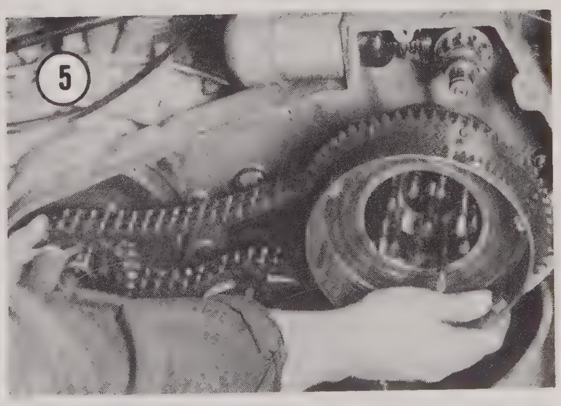
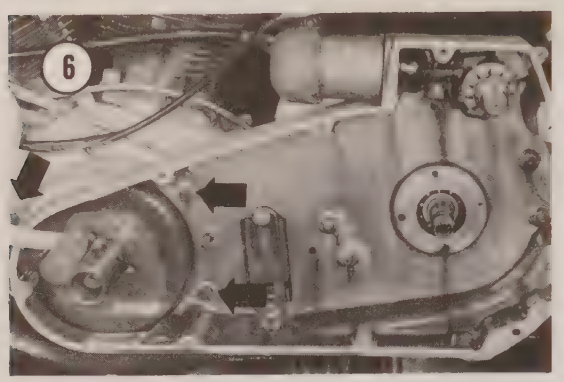




20. Disconnect wire at solenoid.

21. Pull inner primary chain cover from transmission main shaft.

22. Remove chain oiler hose at oil pump.

23. Remove remaining hoses from back of inner primary chain cover.

24. Remove generator or alternator wiring.

25. Remove wire from circuit breaker at coil Also disconnect wire at oil pressure switch.

26. Remove crankcase breather tube.

27. Drain oil. Remove oil lines at oil pump.

28. Disconnect master cylinder and side plate attachment hardware so that master cylinder is free to swing down and away from crankcase. It is not necessary to disconnect its hydraulic line.

29. Remove exhaust system.

30. Remove front and rear engine mount bolts (**Figure 8**).

31. Make a final check to be sure that there are no connections to engine, then lift it from right side of motorcycle.

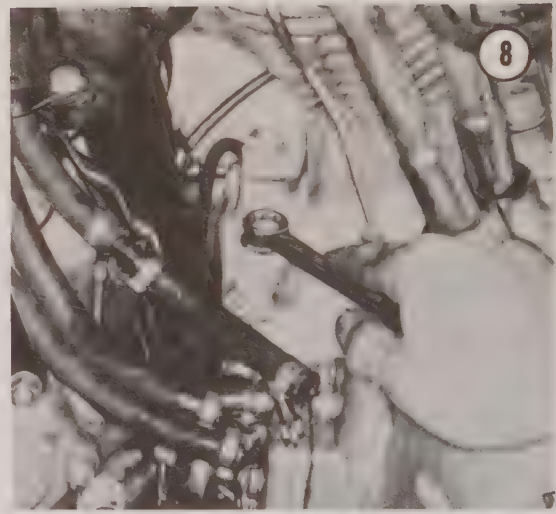
Reverse the foregoing steps to install the engine. Observe the following notes.

1. Do not tighten transmission base nuts until engine and transmission are secured to the chain housing.

2. On 1965 and later models, apply Loctite, grade "A", to transmission shaft ball bearing recess in chain housing and on shaft.

3. Pack ball race with grease after housing is installed.

4. Always use a new primary case cover gasket upon installation. Use aluminum paint to seal surfaces of chain housing where it joins engine and transmission.



> NOTE: *Chain housing must be airtight after installation. Sealing integrity may be checked with a vacuum gauge. With engine running at 1,500 rpm, vacuum gauge must indicate 12 inches of water or greater.*

Be sure to check the following items before starting engine.

a. Engine oil supply
b. Transmission oil supply
c. Clutch adjustment
d. Throttle, choke, clutch, and spark control cables
e. Drive chain adjustment

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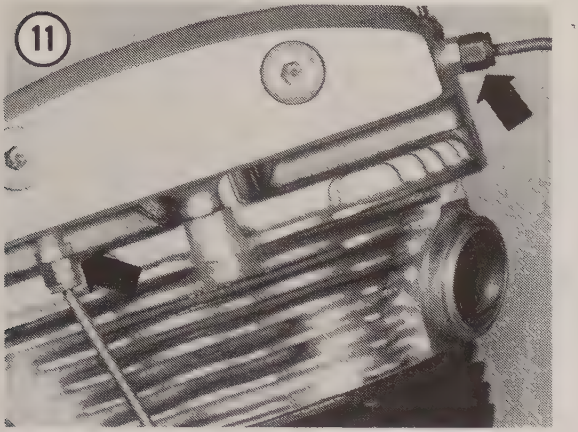

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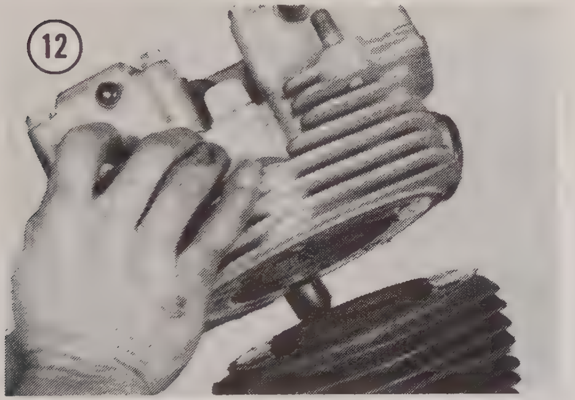


f. Ignition timing
g. Valve adjustment

CYLINDER HEADS

Figure 9 is an exploded view of a cylinder head on 1965 and earlier models. **Figure 10** illustrates the cylinder head used on later models. Refer to applicable illustration during service.

Removal

Before removing cylinder head, perform foregoing Steps 1 through 9 of *Preparation for Engine Disassembly,* then proceed as follows.

1. Press each pushrod cover spring retainer downward, then remove each pushrod cover keeper. Telescope lower pushrod cover over upper cover.
2. Turn engine over until both valves are closed in cylinder head to be removed.
3. Remove oil lines (**Figure 11**).
4. Remove cylinder head bolts.
5. Remove cylinder head, rocker cover, pushrods, pushrod covers, and oil lines, as an assembly (**Figure 12**). Tap cylinder head with a rubber mallet if necessary to free it, then remove it.
6. Tag each pushrod so that it may be returned to its original location.
7. Repeat Steps 1 through 6 for the remaining cylinder.

Disassembly (1965 and Earlier)

Refer back to **Figure 9**, then proceed as follows.

1. Remove screws (7), then lift off ring (8), cover (9), and gasket (11). Pad (10) needs no attention if it is in good condition.
2. Remove nuts (12), then lift oiler (13) from studs.
3. Remove rocker arms (15) and bearing halves (14 and 16).
4. Remove pads (17) if installed. Using a suitable valve spring compressor, remove keys (18), then remove collar (19), springs (20 and 21), and collar (22).
5. Pull valves (23) from cylinder head.

NOTE
Tag each part so that it may be returned to its original location.

Disassembly (1966 and Later)

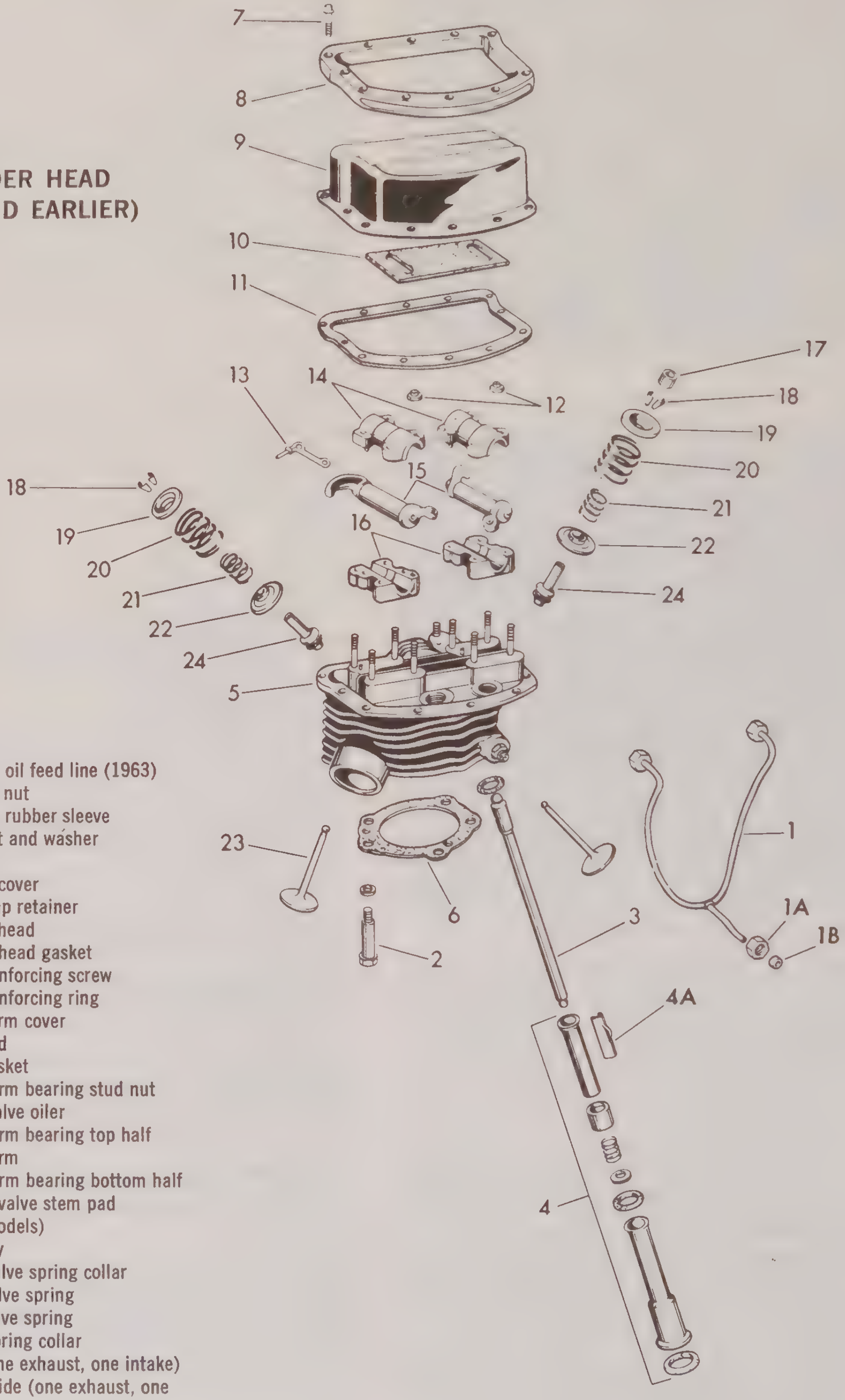
Referring to **Figure 10**, proceed as follows.

1. Remove rocker cover (9) by taking off its retaining nuts (7). Carefully check pads and ball sockets for pitting and wear. Also check for appreciable end-play in each rocker shaft (12).
2. Remove rocker arm shaft screw, acorn nut (1), washer, and O-ring (13). Discard the O-ring.
3. Tap rocker arm shaft (12) from cover to remove rocker arm (15), and spacer (11). Tag rocker arm shafts and rocker arms so that if they are reused, they may be returned to their original locations.

NOTE
Rocker arms are not interchangeable.

(9)

CYLINDER HEAD (1965 AND EARLIER)



1. Overhead oil feed line (1963)
1A. Feed line nut
1B. Feed line rubber sleeve
2. Head bolt and washer
3. Pushrod
4. Pushrod cover
4A. Spring cap retainer
5. Cylinder head
6. Cylinder head gasket
7. Cover reinforcing screw
8. Cover reinforcing ring
9. Rocker arm cover
10. Cover pad
11. Cover gasket
12. Rocker arm bearing stud nut
13. Intake valve oiler
14. Rocker arm bearing top half
15. Rocker arm
16. Rocker arm bearing bottom half
17. Exhaust valve stem pad (early models)
18. Valve key
19. Upper valve spring collar
20. Outer valve spring
21. Inner valve spring
22. Lower spring collar
23. Valve (one exhaust, one intake)
24. Valve guide (one exhaust, one intake)

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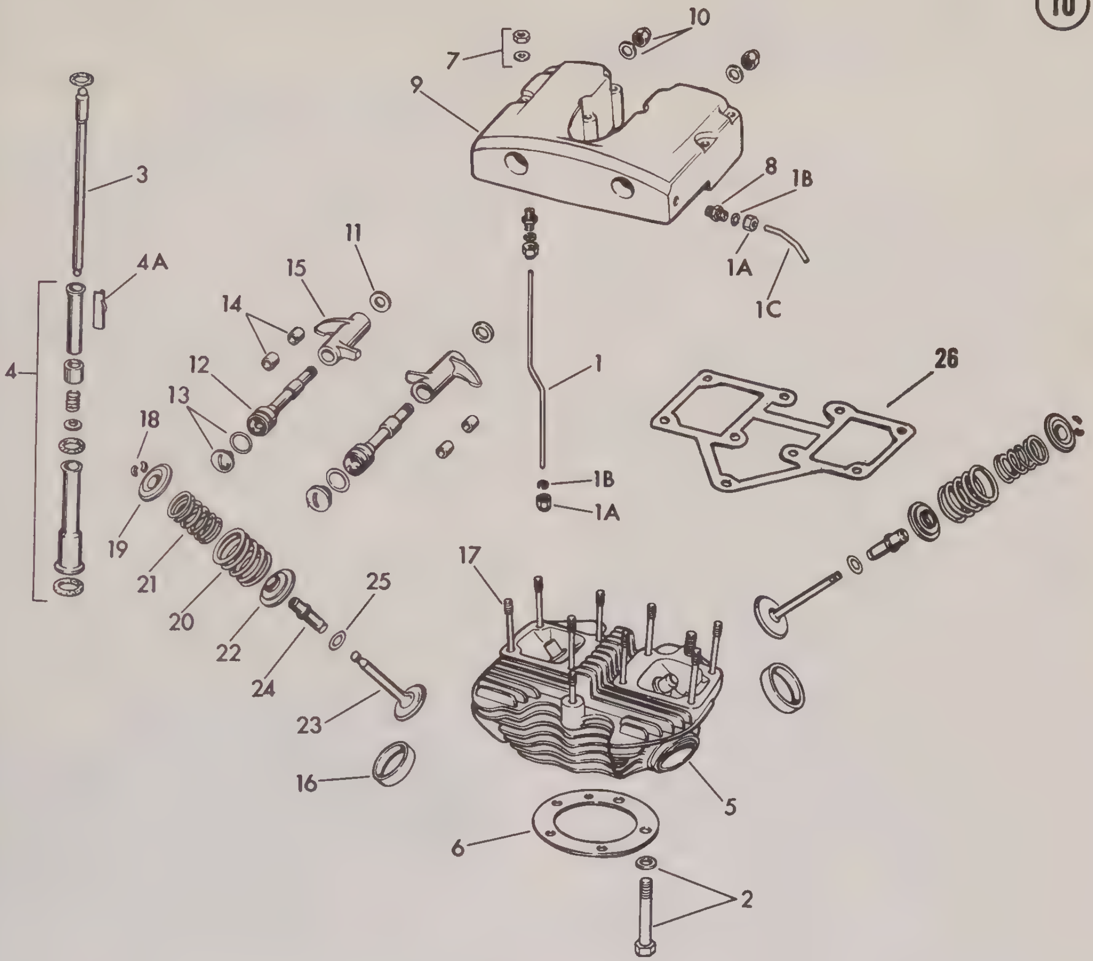

CYLINDER HEAD — 1966 AND LATER

1. Overhead oil feed line
1A. Feed line nut
1B. Feed line rubber sleeve
1C. Cylinder interconnecting oil line
2. Head bolt and washer
3. Pushrod
4. Pushrod cover
4A. Spring cap retainer
5. Cylinder head
6. Cylinder head gasket
7. Rocker housing nut and washer
8. Oil feed line nipple
9. Rocker arm housing
10. Rocker arm shaft acorn nut and washer
11. Rocker arm spacer
12. Rocker arm shaft
13. Rocker arm shaft screw and O-ring
14. Rocker arm bushing
15. Rocker arm
16. Valve seat insert (one exhaust, one intake)
17. Rocker housing stud
18. Valve key
19. Upper valve spring collar
20. Outer valve spring
21. Inner valve spring
22. Lower spring collar
23. Valve (one exhaust, one intake)
24. Valve guide (one exhaust, one intake)
25. Valve guide gasket
26. Rocker housing gasket

4. Compress valve springs, using a suitable valve spring compressor (**Figure 13**). Remove valve keys (**Figure 14 A**), springs, and valves. Keep each part with its associated valve, so that all parts may be returned to their original locations.

Inspection

1. Clean all parts in solvent. Blow compressed air through all oil passages to make sure they are clear.
2. Carefully examine rocker arm pads and ball sockets for pitting and excessive wear.
3. Check clearance between rocker arm shafts and rocker arm bushings. Replace bushings if clearance exceeds 0.002 in.
4. Be sure that rubber oil line nut sleeves are in good condition. Replace if in doubt.
5. Check that clearance is less than 0.002 in. Be sure to strike bearing edges smoothly before measuring to ensure alignment of parts.
6. Repeat Steps 1 through 5 as required.
7. Measure each spring's free length and compare it to the new length given in **Table 1**. Replace any spring that has sagged more than 1/8 in. shorter than a new spring.

Your dealer may have a valve spring tester to measure tension (pounds) at a given compressed length.

8. Clean the intake and exhaust valve guides, using a suitable reamer. Harley-Davidson tool 94830-47 is available for this job.
9. Check clearance between valve guides and valve stems. Replace valves and/or guides if clearance exceeds 0.008 in. for exhaust valves, or 0.006 in. for intake valves.
10. Inspect pushrods for wear. If ball ends are flattened, replace pushrods.

Rocker Arms

On 1966 and later models, if rocker arm bushings are worn, press or drive them from rocker arms. Press in new bushings with oil hole correctly aligned and split portion of bushing toward top of rocker arm. Line ream new bushings using Harley-Davidson tool 94804-57.

Clearance between bushings and rocker arm shafts should be 0.001-0.002 in.

On earlier models, worn but otherwise serviceable rocker arm bearings may be serviced as follows.

1. Remove locating dowels from bearing covers.
2. Using emery cloth on a smooth surface, lightly sand an equal amount from mating surfaces of upper and lower bearings.
3. Assemble bearings, then line ream with a 7/8 in. reamer.
4. Disassemble, then assemble with rocker arm.

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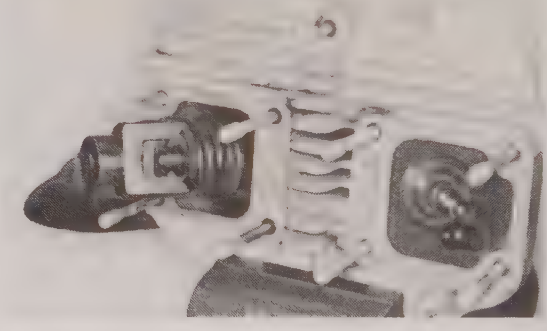

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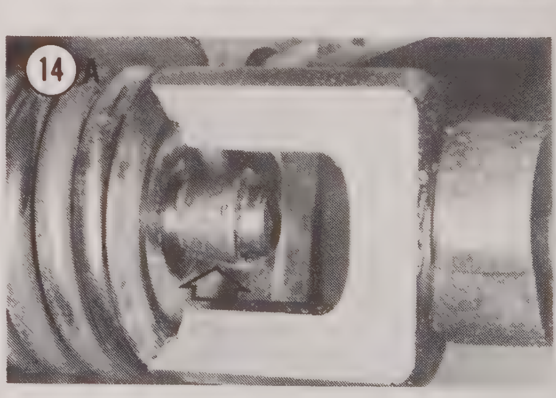

Table 1 VALVE SPRING FREE LENGTH (NEW)

Model	Outer	Inner
1970 and later	1-31/32 in.	1-23/64 in.
1959 - 1969 FLH	1-31/32 in.	1-23/64 in.
1959 - 1969 FL	1-13/16 in.	1-15/32 in.

5. Check that clearance is less than 0.002 in. Be sure to strike bearing edges smoothly before measuring to ensure alignment of parts.
6. Repeat Steps 1 through 5 as required.

> *NOTE*
> *Rocker arms must be free in bearings. Hydraulic valve lifters will not fill otherwise.*

Valves and Valve Seats

Valves and valve seats should be ground to 45°. Valve seat width should be 1/16 in. Replace valves if grinding leaves edges thin or sharp. If ends of valve stems exhibit uneven wear, they may be ground.

Valve and seat service is best left to a dealer with the necessary equipment, or to an automotive machine shop.

Valve Guides

Valve guides are pressed into cylinder heads, and may be removed when worn by driving out with a suitable drift. After new guides are pressed in, they should be reamed to provide 0.002-0.004 in. clearance for intake valves, and 0.004-0.006 in. clearance for exhaust valves.

Valve guides must be a tight press fit in cylinder heads. If standard guides are loose, oversizes of 0.001 to 0.006 in. are available. Since valve seats will probably not be concentric with new valve guides, it is important to resurface the valve seats after valve guide installation.

Valve Seats

Valve seats are replaceable, if necessary. This operation is best done by the factory. Any Harley-Davidson dealer can arange for this.

Cylinder Head Assembly

Reverse the disassembly procedure to assemble cylinder heads. Observe the following notes.

1. Lightly lubricate valve stems and seats, also rocker arms.
2. Be sure that rocker arms work freely, with no binding.
3. Always install new gaskets and O-rings.
4. Be sure that there is a flat washer under each rocker arm cover screw. Tighten screws in order a little at a time until all are torqued to 20 ft.-lb.

Cylinder Head Installation

Reverse the removal procedure to install cylinder heads. Observe the following notes.

1. Be sure that cylinders and cylinder heads are clean.
2. Turn engine over so tappets are in their lowest position, then install cylinder head, pushrods, and pushrod covers as an assembly.
3. Be sure that pushrod ends fit properly in tappet adjustment screw sockets at lower ends, and in pushrod sockets at upper ends.
4. Install each cylinder head bolt with a flat washer under its head. Snug up all bolts, then tighten each of them in turn 1/8 to 1/4 turn at a time until they are all torqued to 65 ft.-lb.
5. Replace intake manifold, then slip O-ring into position. Tighten crankcase stud nut.

> *NOTE*
> *Manifold and cylinder head must be perfectly aligned, O-rings must be in good condition, and manifold clamps must be secure to prevent air leaks.*

Pushrod Adjustment

The pushrods must be adjusted when assembling an engine. After proper assembly, the hydraulic lifters eliminate the requirement for periodic valve adjustment.

There are 2 ways to adjust the pushrods: "wet" or "dry." In both cases the engine must be cold, and the valve being adjusted must be fully closed. You can verify valve position by observing the corresponding pushrod on the other cylinder. For example, when the rear cylinder intake valve is raised fully open, the front cylinder intake valve is fully closed, and the front intake pushrod can be adjusted.

Wet Hydraulic Lifter

If you are adjusting the pushrod without disassembling and cleaning the hydraulic lifter, there is some oil in the hydraulic lifter (it's "wet").

1. Press down on the pushrod cover spring retainer, then remove the keeper at its upper end. Telescope the cover upward and prop it up. Do this for all 4 covers.
2. Turn the engine to move the lifter to its lowest position.
3. Loosen the locknut (**Figure 14B**) and turn the adjuster up into the pushrod until the pushrod is noticeably loose.
4. Back the adjuster down slowly out of the pushrod just until all noticeable vertical play is taken up.
5. Mark one flat of the adjuster, and back the adjuster down out of the pushrod 4 full turns. Tighten the locknut.
6. Wait 2 or 3 minutes for the hydraulic lifter to "bleed down"—the pushrod can then be spun with your fingers—then go on to the next tappet. *Do not* turn the engine over until the lifter has bled down.

Dry Hydraulic Lifter

When adjusting the pushrods with a clean dry hydraulic lifter (as during engine assembly), use this procedure.

1. Turn the engine to move the lifter to its lowest position.
2. Install the pushrod and turn the adjuster (**Figure 14B**) down out of the pushrod until the adjuster bottoms the hydraulic lifter piston in its bore.
3. Turn the adjuster up into the pushrod 1-1/3 turns, and tighten the locknut.
4. Go on to the other pushrods.

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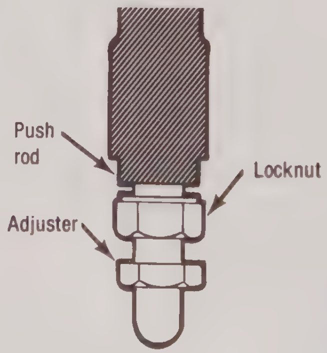

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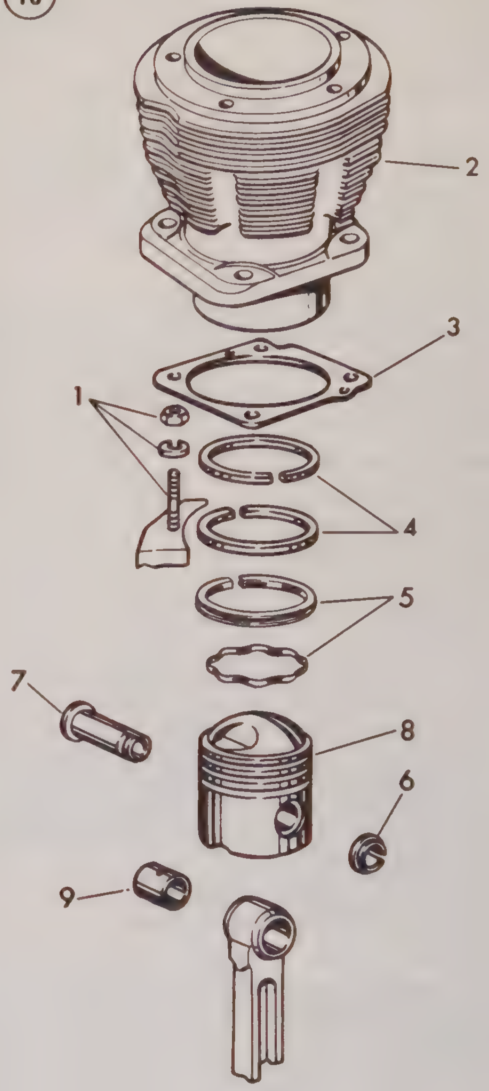

PISTON AND CYLINDER

1. Cylinder base stud nut and washer
2. Cylinder
3. Cylinder base gasket
4. Piston rings (2 compression)
5. Oil control piston ring and expander spring
6. Piston pin lock ring
7. Piston pin
8. Piston
9. Piston pin bushing

PISTONS AND CYLINDERS

Figure 15 is an exploded view of a typical piston and cylinder. Refer to that illustration during disassembly and service.

Cylinder and Piston Removal

1. Remove cylinder heads.
2. Remove all dirt and foreign material from around cylinder base.
3. Remove 4 cylinder base nuts.
4. With piston at bottom dead center, lift cylinder from crankcase (**Figure 16**).
5. Stuff clean rags into crankcase opening to prevent entry of foreign material.
6. Pry out piston pin lock rings, then tap out piston pin using a suitable drift (**Figure 17**). Take care not to bend connecting rods during this operation.

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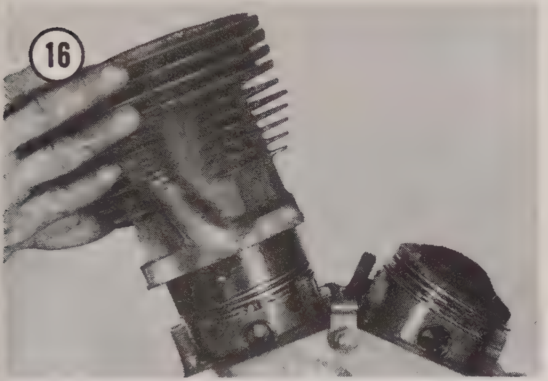

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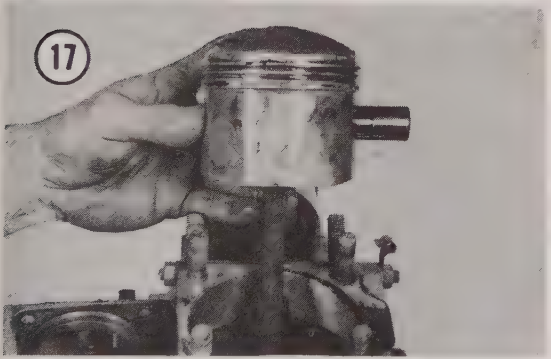

Inspection

1. Immerse piston, piston pin, and cylinder in a suitable carbon and gum solvent until all deposits are loosened, then scrub in cleaning solvent to completely remove deposits. Heavy carbon deposits may be scraped off first.
2. Be very careful when removing carbon from piston heads. The rounded end of a discarded hacksaw blade makes a good carbon removal tool (**Figure 18**).
3. Very carefully remove piston rings over the top of each piston (**Figure 19**). Piston ring pliers make this job easier, and minimize chances of broken rings, if such a tool is available.
4. Scrape carbon and gum from piston ring grooves, using a broken ring (**Figure 20**), or a ring groove cleaning tool. Any deposits left in ring grooves will cause replacement rings to stick, resulting in gas blow-by and loss of power.
5. Measure clearance between piston pin and bushing in connecting rod. Replace connecting rod bushing if clearance exceeds 0.002 in. Be sure that piston pins are not grooved, pitted, or scored. Piston pins should be a light hand press fit in pistons.

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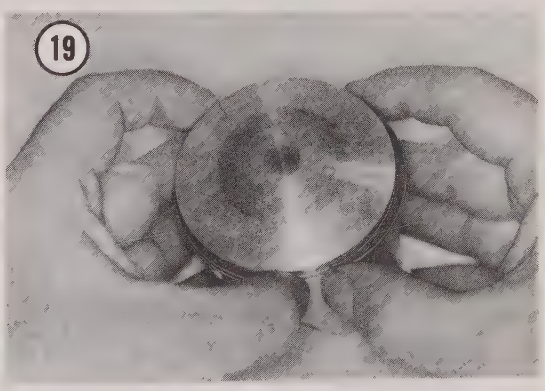

6. Examine pistons and cylinders for evidence of seizure, cracks, grooves, and burrs.

7. Measure inside diameter of cylinders at 3 depths within each cylinder. Make the first measurement about ½ in. below the top of the cylinder, then the other 2 at approximately the center and bottom of piston ring travel area. Make these measurements both parallel and at right angles to the piston pin.

8. Measure pistons at right angles to the piston pin (**Figure 21**) across the extreme bottom of the piston skirt.

Piston Clearance

Piston clearance is the difference between piston diameter measured in foregoing Step 8, and maximum cylinder diameter measured in Step 7. If cylinders are not scored and are not worn more than 0.002 in., it is not necessary to refinish oversize. If piston clearance is 0.002 to 0.006 in., a new standard piston, or one of the same oversize, should be installed. If cylinders are tapered or out-of-round by more than 0.002 in., they should be bored and honed to the next oversize.

Finished cylinder size is determined by the piston to be used. Measure piston diameter, then add desired piston clearance to determine cylinder size. Desired clearance is 0.0010-0.0020 in.

Example:

Piston diameter	3.4375
+ Desired clearance	0.0010
Cylinder diameter	3.4385

Bore and hone the cylinder to 3.4385 in.

Pistons are available in oversizes from 0.01 in. to 0.07 in. in increments of 0.01 in. Do not rebore cylinders beyond 0.07 in. oversize.

Slightly roughen cylinder bore with No. 150 emery paper or a No. 300 hone before installation. This operation provides a better surface for ring seating and lubrication.

Piston Rings

Before installing piston rings, insert each one about ½ in. into its cylinder, then measure ring gap, using a suitable feeler gauge (**Figure 22**). To ensure that rings are inserted squarely, push them into position with the base of the piston. Ring gap should be 0.010-0.020 in. If gap is less than specified, file ends with a fine file.

Before installing rings, roll each one around in its groove to check for binding (**Figure 23**). If any exists, find out and correct its cause before proceeding.

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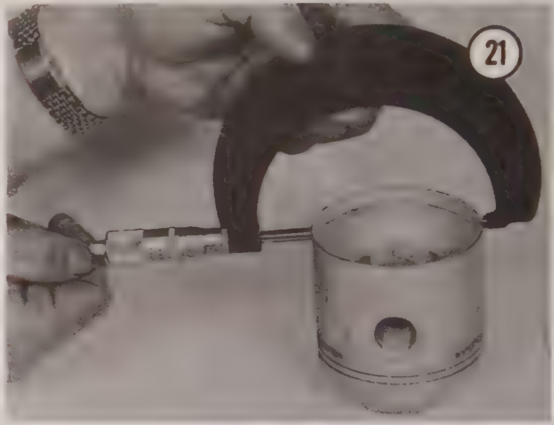

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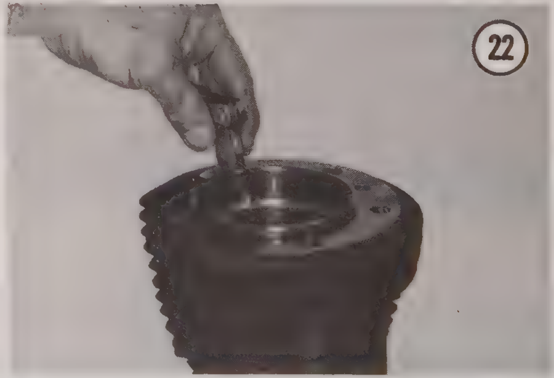

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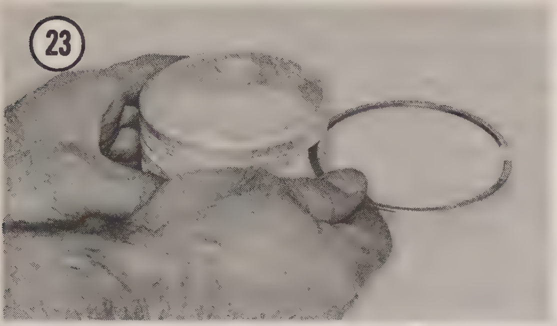

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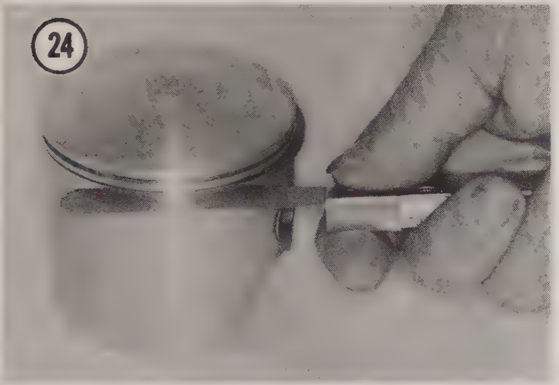

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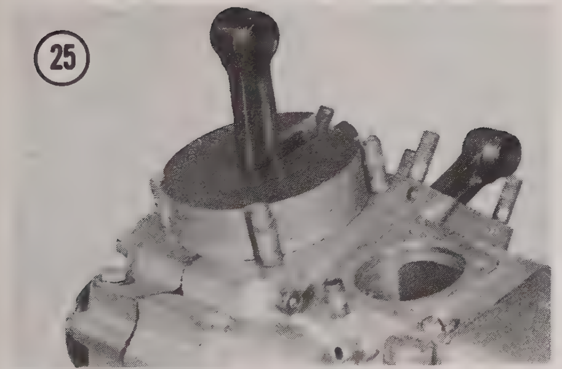

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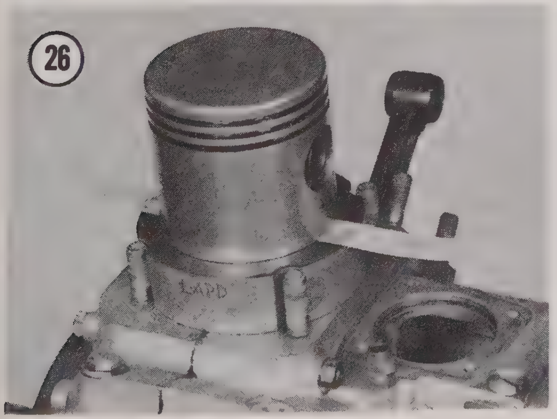

Install rings on pistons, using piston ring pliers. Be sure that chamfer on inside of ring faces piston head. Stagger piston ring gaps around piston at intervals of approximately 120 degrees.

Measure side clearance of piston rings, using a feeler gauge, as shown in **Figure 24**.

Side clearance of compression rings should be 0.004-0.005 in., and side clearance of oil rings should be 0.003-0.005 in.

Checking Connecting Rod Alignment

Noise and rapid wear will result if connecting rods are bent or twisted. To check alignment, proceed as follows.

1. Clean seating area of crankcase, then install piston squaring plate, tool 96179-18, as shown in **Figure 25**.
2. Temporarily install a piston which does not have its skirt cut away, such as one from an older 61 cu. in. engine.
3. Insert narrow paper strips under piston, as shown in **Figure 26**. Press piston down lightly, then pull out each strip, noting effort required to do so.
4. Repeat Step 3 for both forward and rear positions of crankpin, and for each cylinder.
5. If same amount of drag is noticed for both strips of paper in both flywheel positions, rod is square. If rod is not square, there are 3 possibilities:
   a. If piston is high on opposite sides for both crankshaft positions, rod is twisted.
   b. If piston is high on same side for both crankshaft positions, rod is bent.
   c. If piston is nearly square in one position but not the other, rod is both twisted and bent.

Twisting and bending may be corrected by inserting a suitable rod through the piston pin hole, then forcing the rod into alignment. This rod should be as close to the inner diameter of the piston pin hole as possible.

Cylinder and Piston Installation

Installation is essentially a reversal of the removal procedure. Observe the following notes.

1. Always install new piston pin lock rings. If it should be necessary to remove a new one, do not use it again.
2. Note that there is a web on one piston pin boss inside piston (**Figure 27**). Install both pistons so that these webs are to the right side of engine.
3. It may be easier to insert piston pins if pistons are warmed first. A convenient method for doing so is to wrap pistons in rags which have been soaked in hot water.
4. Always install new cylinder base gaskets.
5. Lubricate piston and cylinder with engine oil before installation.
6. It will be necessary to compress each ring as it enters the cylinder. A worm gear type hose clamp of appropriate size makes a convenient tool for this purpose.
7. Turn engine until crankpin is at bottom center, then slide cylinder down over piston.
8. Install cylinder base nuts and washers. Tighten nuts firmly.
9. Install cylinder head.

TAPPETS AND TAPPET GUIDES

Harley-Davidson motorcycles are equipped with roller tappets and hydraulic lifters. Each hydraulic unit consists of a piston, cylinder, and check valve. In operation, these hydraulic units pump themselves full of engine oil, thereby taking up all play in the valve train.

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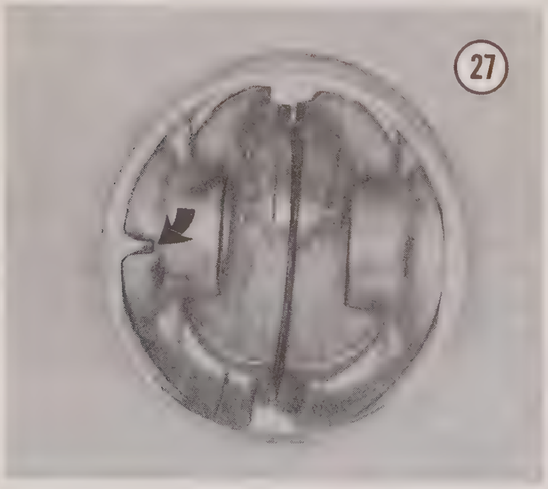

Figure 28 is an exploded view of a typical tappet assembly. Refer to that illustration during service.

1. Remove all dirt from tappet area. Blow clear with compressed air.
2. Remove 4 tappet guide retaining screws.
3. Remove hydraulic unit (**Figure 29**).

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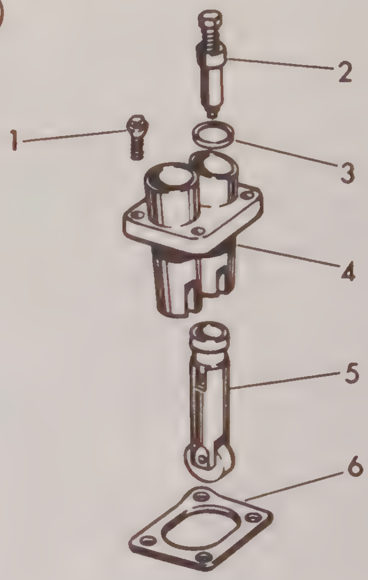

TAPPET ASSEMBLY

1. Tappet guide screw
2. Pushrod hydraulic unit
3. Pushrod cover cork washer
4. Tappet guide
5. Tappet and roller assembly
6. Tappet guide gasket

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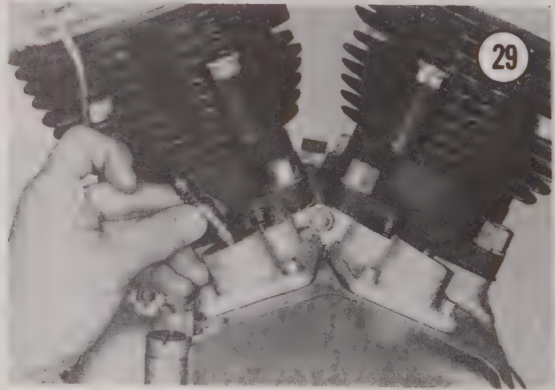

4. Strike tappet guide lightly with a rawhide or soft metal mallet to loosen it, then remove from gearcase (**Figure 30**). Take care not to drop tappets into gearcase as guides are removed.
5. Remove cork washers.
6. Pull tappet and roller assembly out from bottom of guide.

Inspection

Clean all parts in solvent. Note that hydraulic units are selectively fitted, and their parts may not be interchanged, so clean them separately, one at a time. Twist and pull piston and spring to separate from cylinder.

Blow out all oil passages, using compressed air. A piece of wire inserted into tappet guide oil passages will ensure that they are open.

Check clearance between each tappet and its guide. Replace worn parts if clearance should exceed 0.003 in.

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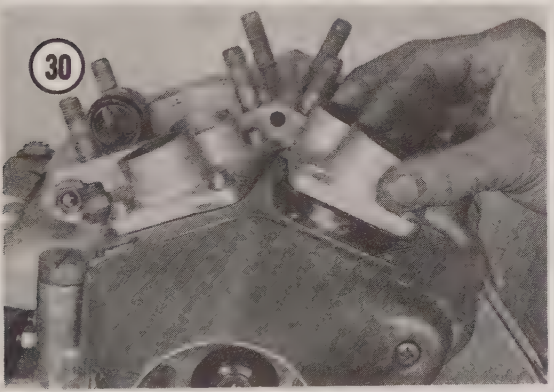

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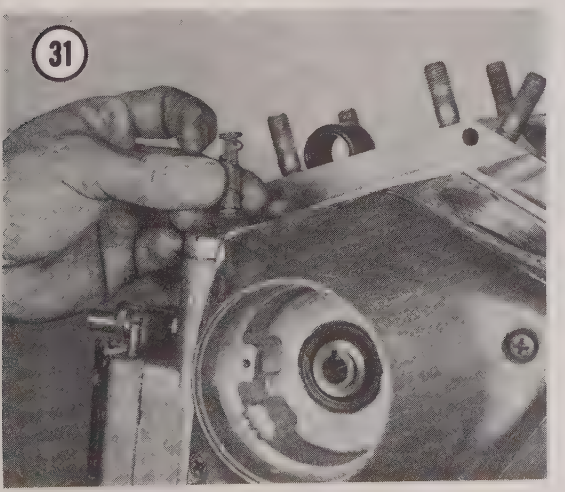

Rollers may be replaced if necessary, but it is better to replace complete tappet. If roller only is replaced, it must fit needle bearing with 0.0005 to 0.0010 in. radial clearance, and approximately 0.008 in. end-play after installation.

To check hydraulic units, proceed as follows.

1. Clean all parts and allow to air dry. Be sure that check valve ball and its seat are dry.
2. Assemble unit dry.
3. Hold upright (as installed on motorcycle), then press piston down. Do not cover hole in bottom of cylinder.
4. Hold unit compressed for 6 seconds, then release piston suddenly.
5. If piston springs back, unit is serviceable. If piston does not spring back, repeat Steps 3 and 4, but with hole in cylinder covered.
6. If piston does not spring back, replace entire unit. If piston springs back with hole covered, ball check valve is not seating, and unit should be replaced.
7. If hydraulic units malfunction, there is a possibility of a clogged oil screen. Remove cap screw near rear tappet guide, then remove screen (**Figure 31**). Run engine with this screen removed (replace cap screw) long enough to compare operation with and without it.

Reassembly

1. Insert tappets into guides, so that flat surfaces and oil holes are facing each other, toward center of guide (**Figure 32**).
2. Hold tappets in position, then insert guides into gearcase. Do not allow tappets to drop into

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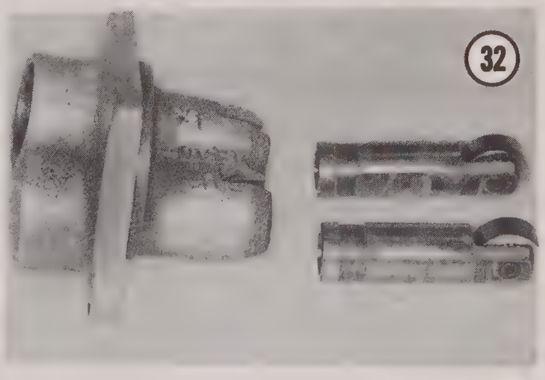

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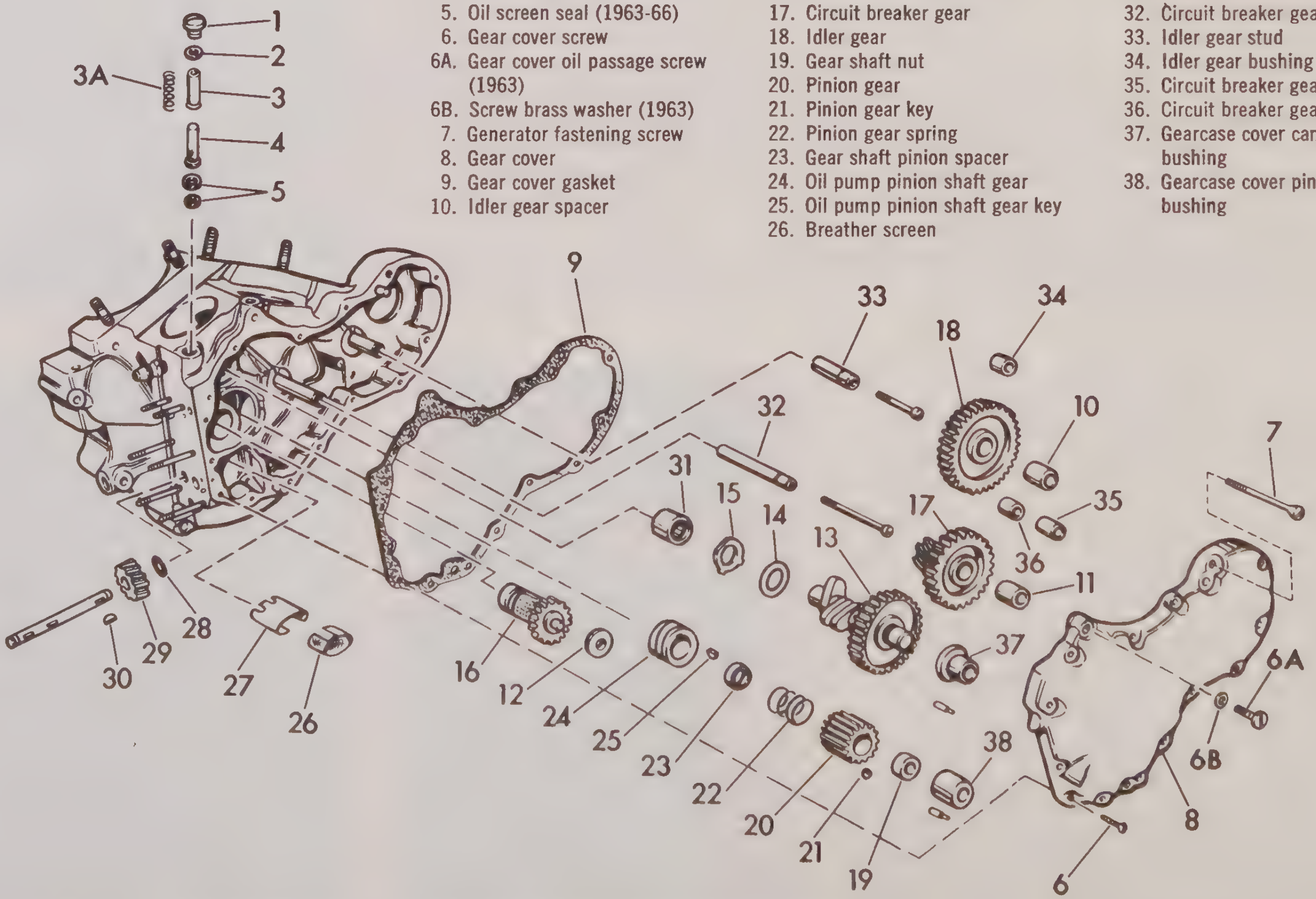
GEARCASE COMPONENTS (1969 AND EARLIER)

1. Oil screen cap
2. Cap gasket
3. Oil screen body (not used on 1963 and later models)
3A. Spring (1963 and later)
4. Oil screen
5. Oil screen seal (1963-66)
6. Gear cover screw
6A. Gear cover oil passage screw (1963)
6B. Screw brass washer (1963)
7. Generator fastening screw
8. Gear cover
9. Gear cover gasket
10. Idler gear spacer
11. Intermediate gear spacer
12. Breather valve spacing washer
13. Cam gear
14. Cam gear spacing washer
15. Cam gear thrust washer
16. Breather valve and gear
17. Circuit breaker gear
18. Idler gear
19. Gear shaft nut
20. Pinion gear
21. Pinion gear key
22. Pinion gear spring
23. Gear shaft pinion spacer
24. Oil pump pinion shaft gear
25. Oil pump pinion shaft gear key
26. Breather screen
27. Breather separator
28. Oiler drive gear shaft spring ring
29. Oiler driver gear
30. Oiler drive gear key
31. Needle roller cam shaft bearing
32. Circuit breaker gear stud
33. Idler gear stud
34. Idler gear bushing
35. Circuit breaker gear bushing
36. Circuit breaker gear bushing
37. Gearcase cover cam shaft bushing
38. Gearcase cover pinion gear bushing



GEARCASE COMPONENTS (1970-1977)

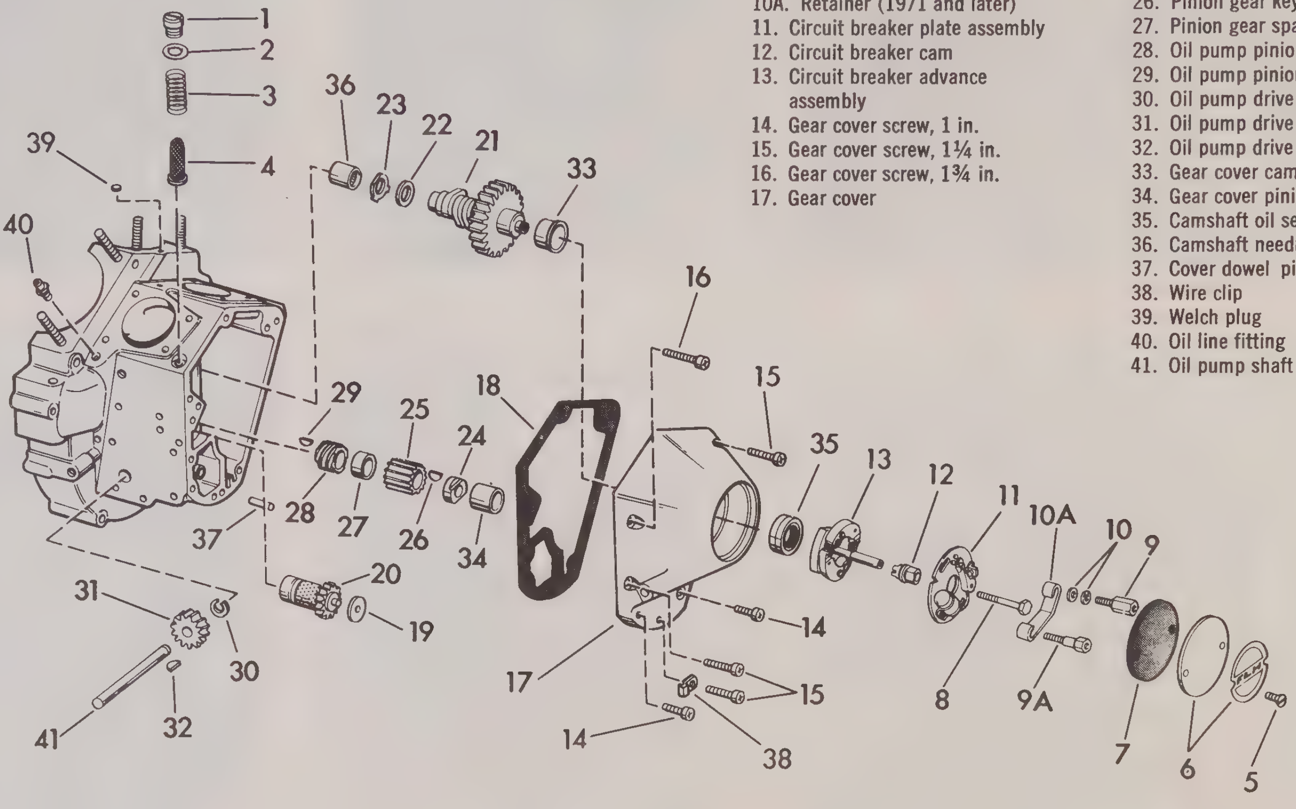
1. Oil screen cap
2. Cap seal
3. Oil screen spring
4. Oil screen
5. Circuit breaker cover screws
6. Circuit breaker cover
7. Circuit breaker cover gasket
8. Circuit breaker cam assembly bolt
9. Circuit breaker plate screw (1970)

9A. Circuit breaker plate screw (1971 and later)

10. Circuit breaker plate screw lockwasher and washer (1970)

10A. Retainer (1971 and later)

11. Circuit breaker plate assembly
12. Circuit breaker cam
13. Circuit breaker advance assembly
14. Gear cover screw, 1 in.
15. Gear cover screw, 1¼ in.
16. Gear cover screw, 1¾ in.
17. Gear cover
18. Gear cover gasket
19. Breather gear washer
20. Breather gear
21. Cam gear
22. Cam gear spacing washer
23. Cam gear thrust washer
24. Gear shaft nut
25. Pinion gear
26. Pinion gear key
27. Pinion gear spacer
28. Oil pump pinion shaft gear
29. Oil pump pinion shaft gear key
30. Oil pump drive gear lock ring
31. Oil pump drive gear
32. Oil pump drive gear key
33. Gear cover camshaft bushing
34. Gear cover pinion shaft bushing
35. Camshaft oil seal
36. Camshaft needle bearing
37. Cover dowel pin
38. Wire clip
39. Welch plug
40. Oil line fitting
41. Oil pump shaft



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gearcase. Note that gaskets should be dry during installation.

3. Install cork gaskets, hydraulic units, and tappet guide retaining screws.
4. Install pushrods.
5. Adjust tappet clearance.

GEARCASE

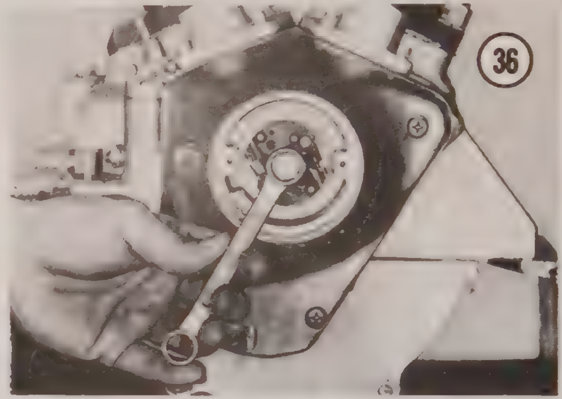
The gearcase is on the right side of the crankcase. It houses a gear train which operates valves, circuit breaker, crankcase breather, and oil pump. DC generators, on models so equipped, are also driven from the gearcase.

Figure 33 is an exploded view of gearcase components on models to 1969, and later models are illustrated in **Figure 34**. Refer to the applicable drawing during service.

Disassembly (1970 and Later Models)

Before disassembling gearcase components, first remove tappets and tappet guides, as described in foregoing *Tappets and Tappet Guides.* Also remove oil screen (refer back to Figure 31).

1. Remove breaker plate (**Figure 35**).
2. Remove cam bolt (**Figure 36**).
3. Pull out breaker cam (**Figure 37**).
4. Remove centrifugal advance mechanism (**Figure 38**).
5. Remove gearcase cover retaining screws, then take off gearcase cover (**Figure 39**). Place a suitable flat pan underneath to catch draining oil. Note cover screws are of different lengths.
6. Remove breather gear washer (**Figure 40**).
7. Pull out breather gear (**Figure 41**).
8. Pull out cam gear (**Figure 42**).
9. Remove cam gear spacer washer and cam gear thrust washer (**Figure 43**).
10. Remove pinion gear nut (**Figure 44**). Note that this nut has left-hand threads. Tool 94555-55 is available to make this job easier.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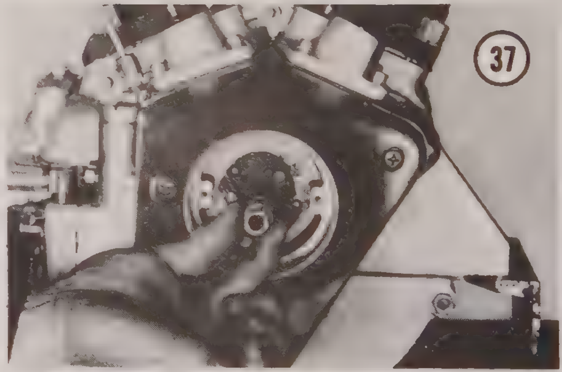
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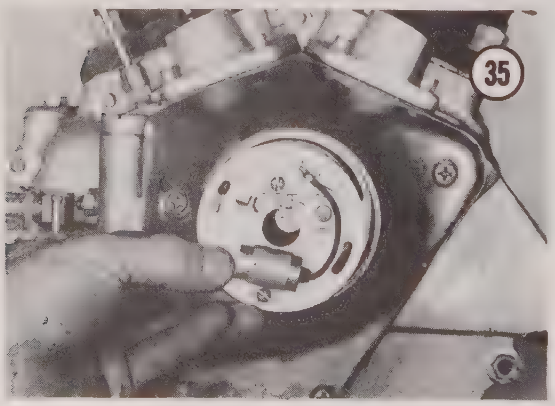
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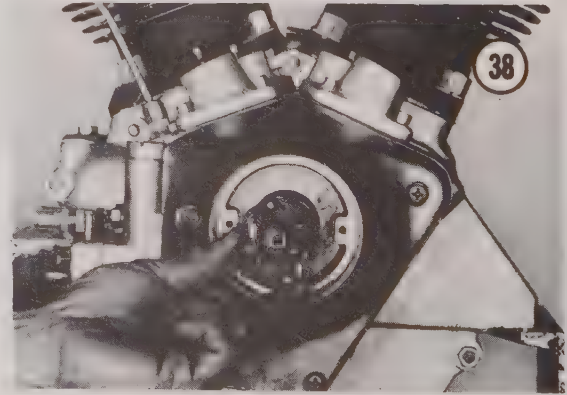
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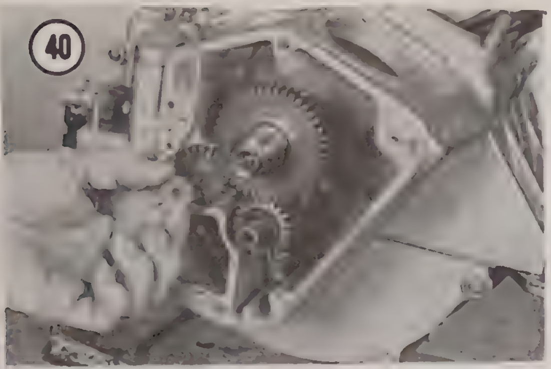
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11. Remove pinion gear (**Figure 45**). A pulling and installation tool, No. 96830-51, is available.
12. Remove the pinion gear Woodruff key (**Figure 46**).
13. Remove pinion spacer (**Figure 47**).
14. Remove the oil pump pinion shaft gear (**Figure 48**).
15. Remove Woodruff key (**Figure 49**).

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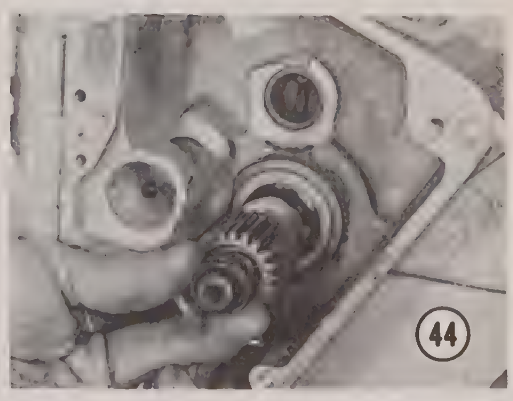
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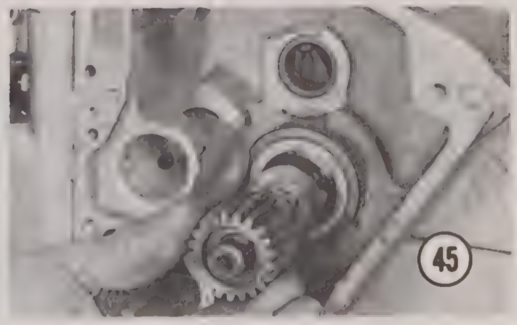
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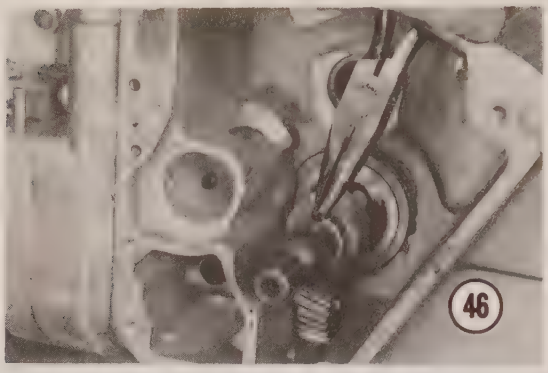

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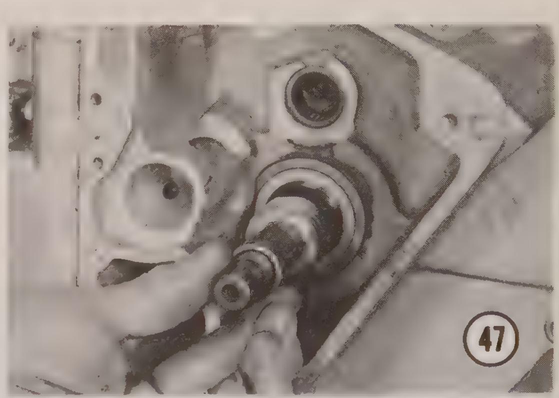

47

Disassembly (1969 and Earlier Models)

Before disassembly, remove pushrods, tappet guides, and tappets, as described in foregoing *Tappets and Tappet Guides*. Numbers in parentheses refer to legend in Figure 33.

1. Remove cap (1), gasket (2), body (3) or spring (3A), and seal or seals (5). To remove screen from housing, rotate it until notch in screen aligns with housing key.
2. Remove cover screws (6), screw (6A), washer (6B), and screws (7). Remove generator.
3. Remove both circuit breaker mounting bolts, then pull circuit breaker from gearcase.
4. Remove gearcase cover (8) and gasket (9). It may be necessary to break cover loose by striking it with a rawhide mallet.
5. Remove spacers (10 and 11). Tag each spacer so that it is returned to its original location upon reassembly. Note that they may be of different thicknesses.
6. Remove washer (12).
7. Remove gear (13), spacer (14), and thrust washer (15).
8. Remove gears (16, 17, and 18).
9. Remove pinion gear shaft nut (19). This nut has a left-hand thread. Tool 94555-55 is available to make this job easier.
10. Using a suitable puller, remove pinion gear (20). Tool 96830-51 is designed to remove and install this gear.
11. Remove key (21), spring (22), spacer (23), gear (24), and key (25).
12. Remove screen (26) and separator (27).
13. Remove snap ring (28), gear (29), and Woodruff key (30).

48

49

Inspection

1. Clean all parts in solvent, then blow dry. If crankcase is not to be disassembled, take care that no solvent finds its way in.
2. Be sure that oil screen (Figure 31) is clean. Small particles or fibers may partially or totally plug it, yet permit light to pass through. Replace it if there is any doubt about its condition.

3. On earlier models, be sure that breather screen (item 26 in Figure 33) is clean.

4. Measure clearance between camshaft and cover bushings. Replace bushings if clearance exceeeds 0.0025 in. Bushings must be reamed to fit after installation. This job is best done by a Harley-Davidson dealer with the necessary equipment.

5. Replace roller bearings if clearance between bearings and shaft exceeds 0.004 in.

6. If the camshaft end shows appreciable wear, 0.003 in. or greater, replace camshaft and needle bearings. Needle bearings may be removed using tool 95760-69, and installed with tool 97272-60. Press on side of bearing with manufacturer's name. Pinion shaft main roller bearing may be replaced only after crankcase halves have been disassembled.

7. On 1970 and later models, be sure that cam gear oil seal is in good condition. Oil leakage will permit oil to get onto breaker points.

8. On 1969 and earlier models, measure clearance between circuit and idler gears and their respective shafts. Replace bushings and/or shafts if clearance exceeds 0.0025 in.

Reassembly

Gearcase component reassembly is essentially the reverse of disassembly. Observe the following items.

Adjust breather gear end-play. To do so, proceed as follows.

1. Assemble breather gear and new, dry gasket.
2. Install breather gear spacer washer.
3. Place a straightedge across gearcase, then measure clearance between spacer washer and straightedge, using a feeler gauge.
4. Subtract 0.006 in. from clearance obtained. This distance is amount that gasket will compress.

Example:

0.008 in.	Clearance
—0.006 in.	Gasket compression
0.002 in.	Total end-play

Desired end-play is 0.001-0.005 in. Spacer washers are available in thicknesses of 0.115, 0.120, and 0.125 in. If end-play exceeds 0.005 in., install a thicker spacer washer.

Cam gear end-play must also be adjusted. To do so, proceed as follows.

1. Install cam gear together with its spacer washer and thrust washer.
2. Install gearcase cover securely, so that its gasket compresses.
3. Measure camshaft end-play through tappet guide hole, using a feeler gauge. End-play should be 0.001-0.005 in.
4. If end-play is not within tolerance, replace spacer washer with a thinner or thicker one, as required. Spacer washers are available in thicknesses of 0.050, 0.055, 0.060, 0.065, 0.070 in.

There are timing marks on breather, cam, and pinion gears. On models to 1969, there is also a timing mark on the circuit breaker gear. Align marks on 1970 and later models as shown in **Figure 50**. On these models, note that when the proper mark on the pinion gear is at 12 o'clock position, there is a second, unused mark at 2 o'clock position. Be careful not to align the wrong mark.

Figure 51 illustrates gear timing mark alignment on models to 1969. When assembling gears, be sure that circuit breaker and idler gears are installed onto their proper shafts.

Be sure that gears rotate freely before installing cover. If not, find out and correct the cause of any binding.

Oil gears liberally upon assembly. About 4 ounces of engine oil poured through tappet holes over gears will provide sufficient initial lubrication. Rotate engine to spread oil.

Install gearcase cover and gasket, using a non-hardening gasket sealing compound.

OIL PUMP

Oil pumps are installed to the rear of the gearcase. Each pump consists of 2 sections: a feed pump which supplies oil under pressure to engine components, and a scavenger pump, which returns oil to the oil tank from the engine.

Oil pumps may be removed as a unit only with the engine removed. They may be disassembled piecemeal, however, with the engine

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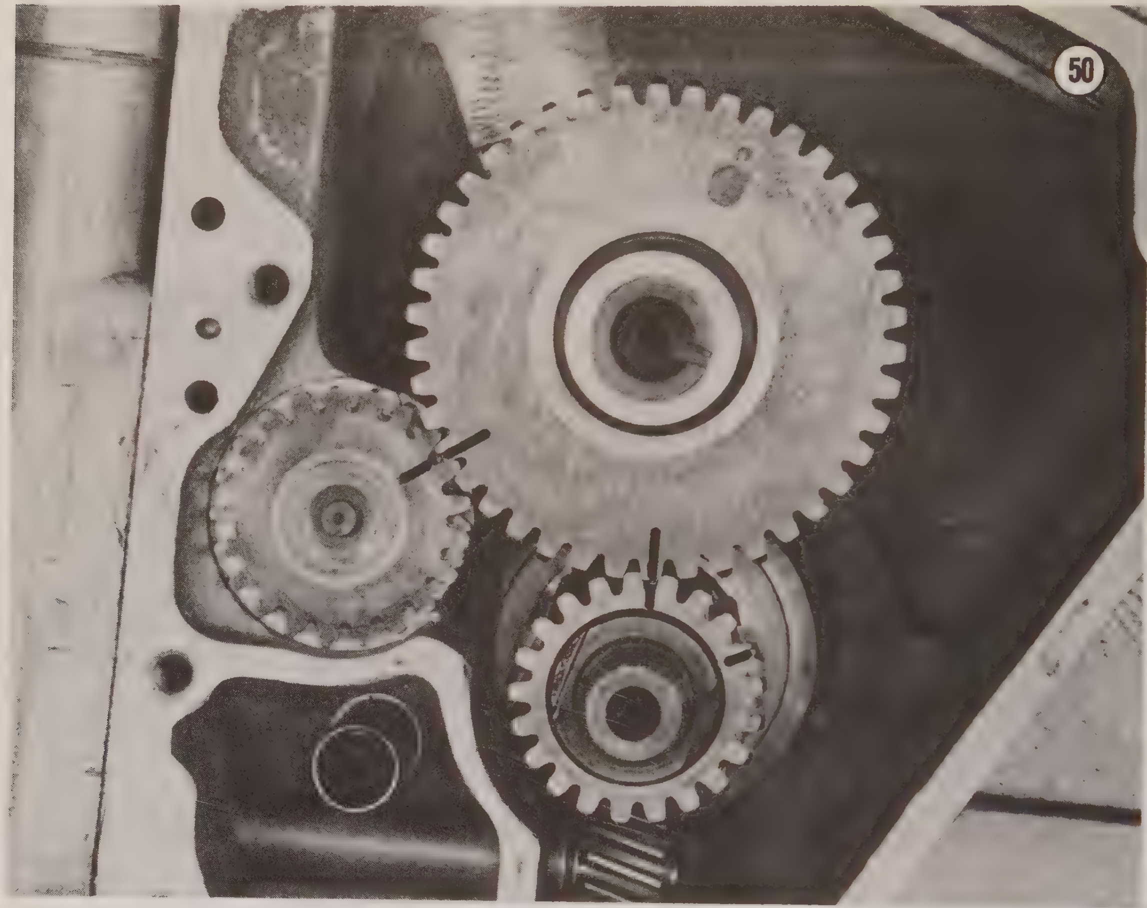

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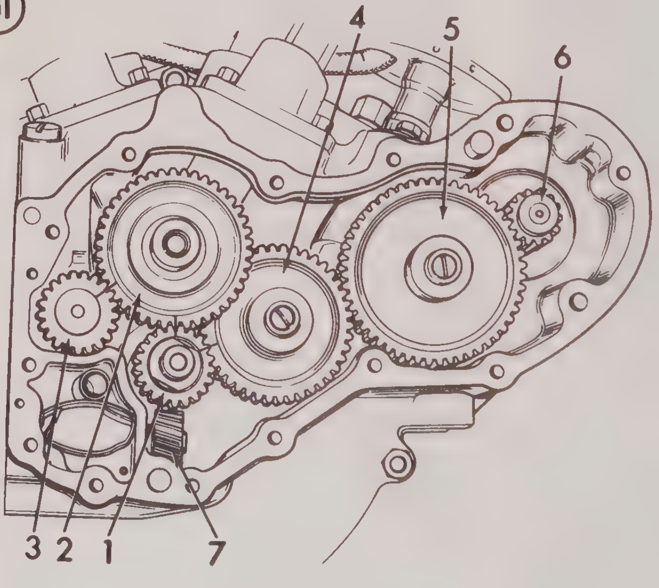


GEAR TIMING
MARK ALIGNMENT
(1969 AND EARLIER)

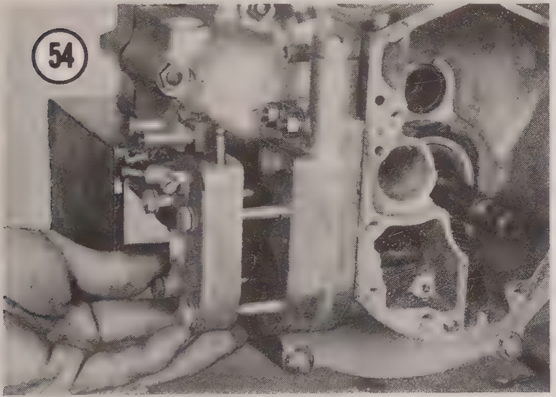
1. Pinion gear
2. Cam gear
3. Breather gear
4. Circuit breaker gear
5. Idler gear (not marked)
6. Generator drive gear (not marked)
7. Oil pump drive gear (not marked); secured on end of pump drive shaft with key and spring ring

in place. Unless its drive gear or drive shaft require service, it is not necessary to remove gearcase cover.

Disassembly

Figures 52 and 53 are exploded views of 1967 and earlier, and 1968 and later oil pumps. Refer to the applicable illustration during disassembly.

1. Remove oil lines at pump. Be sure to tag each line so that it may be returned to its proper location.
2. Remove 4 nuts or bolts and lockwashers (2), then pull off oil pump cover (3) and gasket (4).
3. Remove snap ring (5), gear (6), Woodruff key (7), and gear (8).
4. Remove 2 nuts (9), then pull off pump body (10).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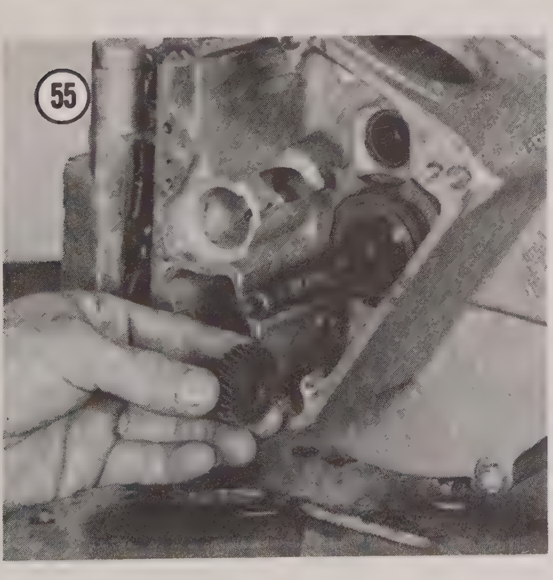
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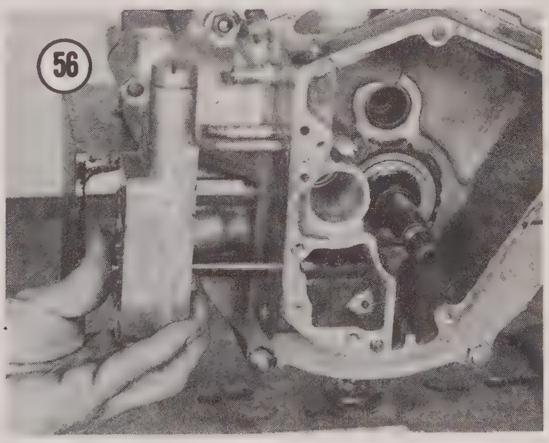
5. Remove gear (12), Woodruff key (13), and gear (14).
6. Disassemble the relief valve plug (15), spring (16), and valve (17).
7. Remove screw (18), spring (19), and ball (20).
8. On models so equipped, loosen chain oiler adjustment locknut (21), then turn in chain oiler adjustment screw (22) until it bottoms lightly, counting the number of turns necessary. Record this number so that it can be backed out a like number of turns upon reassembly. Remove chain oiler adjustment screw.
9. Remove inlet and outlet fittings (24) if necessary for cleaning.

If engine is removed from chassis, it is not necessary to disassemble pump to remove it. Proceed as follows.

1. Remove oil lines. Tag each one so it may be returned to its proper location.
2. Remove oil pressure switch.
3. Remove 4 nuts or bolts and lockwashers, then pull off pump cover (**Figure 54**). Be prepared to catch oil as it drains.
4. Remove gearcase components. Refer to foregoing *Gearcase* section.
5. Remove oil pump drive gear (**Figure 55**) after removing its snap ring and Woodruff key.
6. Remove 2 retaining nuts, then pull off oil pump body together with its drive shaft as shown in **Figure 56**.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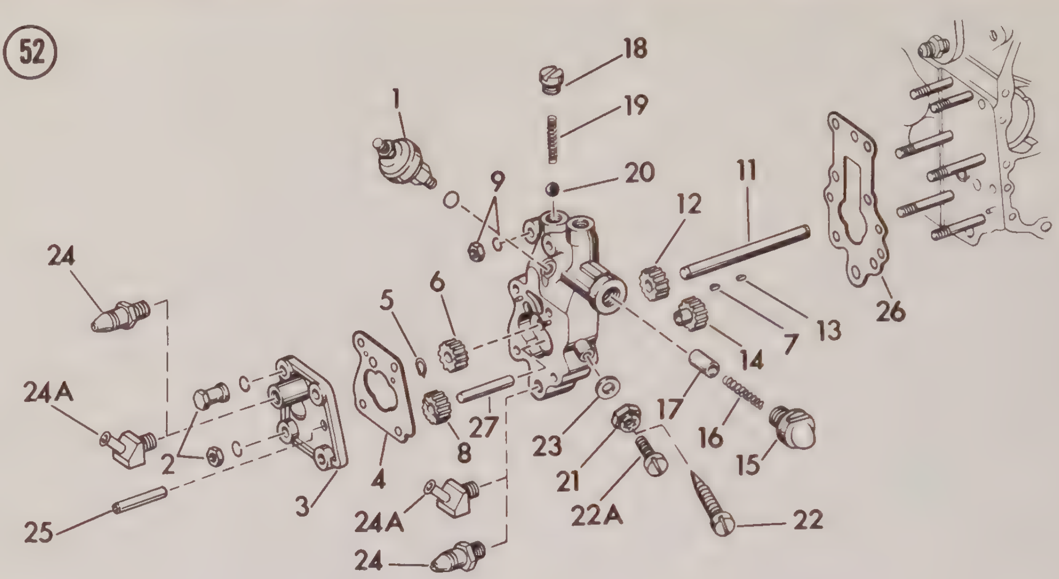
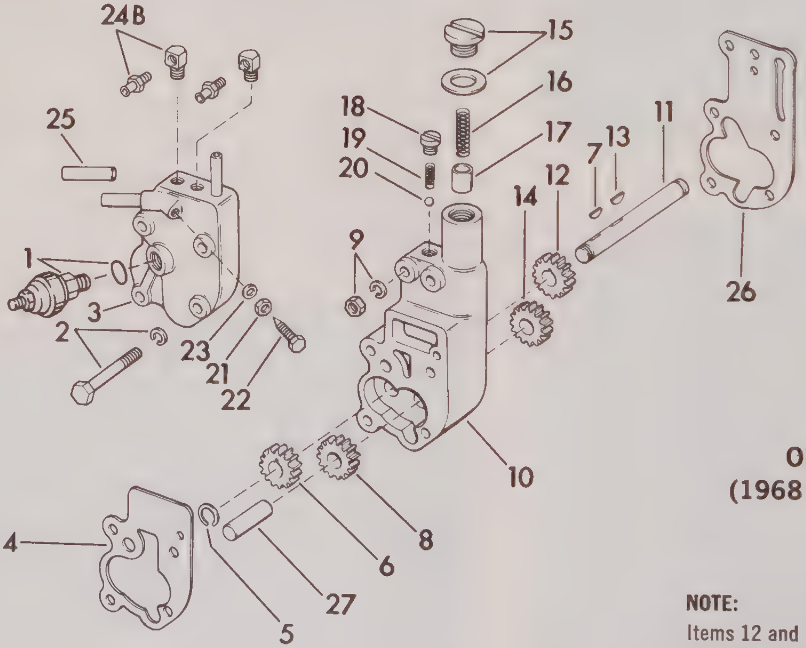

18
1
19
20
9
11
12
24
6
5
26
13
7
14
24A
17
27
16
2
23
8
15
21
4
3
22A
24A
25
22
24

NOTE:
Items 12 and 14 are feed gears.
Items 6 and 8 are scavenger gears.

OIL PUMP — 1967 AND EARLIER

(53)


24B
15
16
25
18
17
19
13
11
20
7
12
14
9
1
26
3
2
23
21
22
10
8
4
6
27
5

OIL PUMP
(1968 AND LATER)

NOTE:
Items 12 and 14 are scavenger gears.
Items 6 and 8 are feed gears.

OIL PUMP (ALL YEARS)

1. Oil pressure switch
2. Cover stud nut or bolt and washer
3. Oil pump cover
4. Cover gasket
5. Lock ring
6. Drive gear
7. Gear key
8. Idler gear
9. Oil pump body mounting stud nuts and washers
10. Oil pump body
11. Oil pump gear drive shaft
12. Drive gear
13. Gear key
14. Idler gear
15. Bypass valve plug
16. Bypass valve spring
17. Check valve spring cover
18. Check valve spring cover screw
19. Check valve spring
20. Check valve ball
21. Chain oiler adjusting screw locknut
22. Chain oiler adjusting screw

22A. Chain oiler screw (1965-67)

23. Chain oiler adjusting screw washer
24. Oil line nipple (1964 and earlier)

24A. Oil line nipple (1965)

24B. Oil line nipple (1968)

25. Chain oiler pipe
26. Body gasket
27. Idler gear shaft

Inspection

Clean all parts in solvent, then blow dry with compressed air. Blow out all oil passages. Check for worn or chipped gear teeth. Replace pump if its relief valve seat is damaged or worn.

Reassembly

Reassembly is essentially the reverse of disassembly. Be sure to install new, factory-supplied gaskets. It is possible to receive gaskets which block off certain oil passages, which may result in severe engine damage. Always install new snap rings.

Torque all attachment bolts or nuts evenly to 50-60 in.-lb. Greater torque will compress gaskets too much, and may result in seized and damaged pump components. Less torque may result in oil leakage.

It is suggested that one-shot original type hose clamps be replaced with worm gear hose clamps of appropriate size. Such hose clamps are available at any auto parts store.

CRANKCASE

Crankcases must be disassembled to service crankshafts, connecting rod bearings, pinion shaft bearings, or sprocket shaft bearings.

Checking Crankshaft End-play

It is recommended that crankshaft end-play be measured before completely disassembling the crankcase. Crankshaft end-play is a measure of sprocket shaft bearing wear.

1. Remove cylinder heads, cylinders, clutch cover, gearcase cover, and timing gears. Do not loosen or remove engine sprocket or compensating sprocket.
2. Mount crankcase in a suitable fixture, so that sprocket shaft is vertical and uppermost.
3. Attach dial indicator to crankcase so that its stem rests on end of sprocket shaft.
4. Pry flywheel upward, and note end-play registering on dial indicator. If end-play exceeds 0.006 in., bearing replacement may be required. If end-play is less than 0.006 in., shims may be used to adjust end-play.

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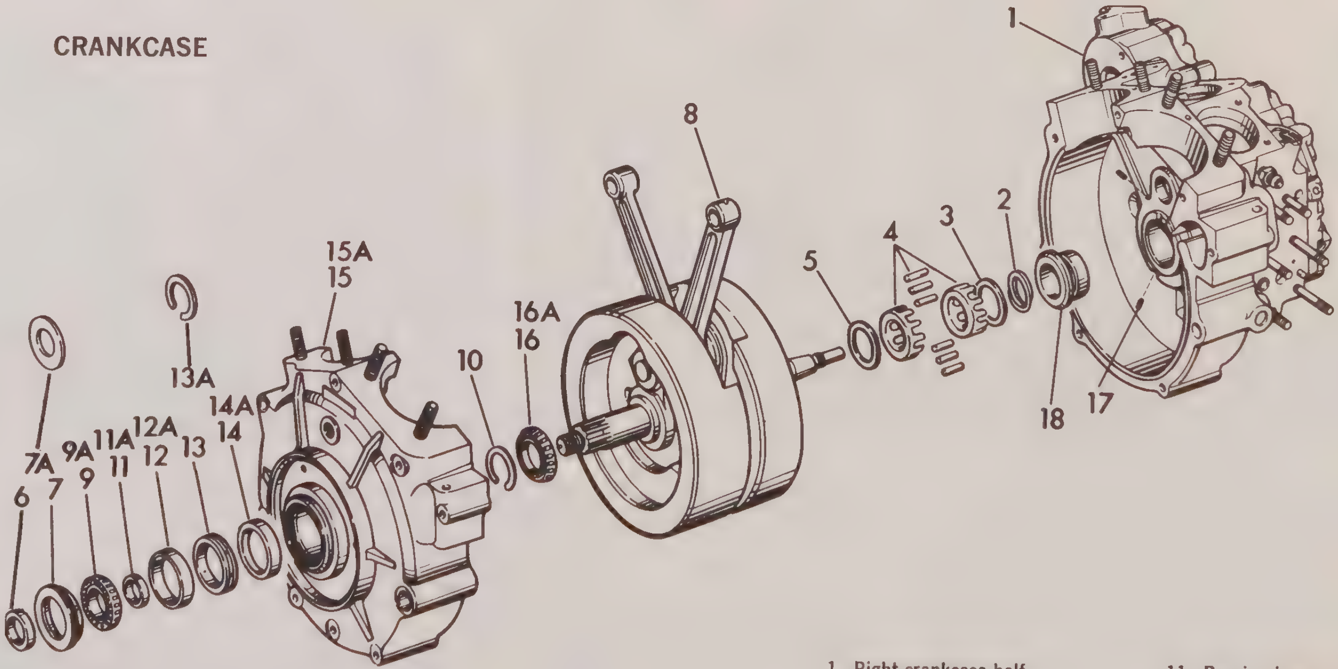
CRANKCASE

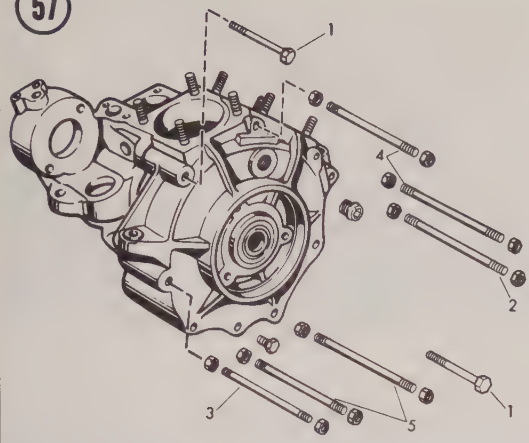


1. Right crankcase half
2. Spiral lock ring
3. Bearing washer
4. Bearings and retainer
5. Bearing washer
6. Sprocket shaft spacer
7. Sprocket shaft bearing nut
7A. Sprocket shaft bearing seal washer
8. Flywheel and rod assembly
9. Sprocket bearing half
9A. Sprocket bearing half
10. Outer race snap ring (1968 and earlier)
11. Bearing inner spacer
11A. Bearing inner spacer
12. Bearing outer race
12A. Bearing outer race
13. Bearing outer spacer
13A. Outer race snap ring
14. Bearing outer race
14A. Bearing outer race
15. Left crankcase half
16. Sprocket bearing half
16A. Sprocket bearing half
17. Pinion shaft bearing race lock screw
18. Pinion shaft bearing race

NOTE:
Letter Suffix "A" indicates new part for 1959 and later models

NOTE:
Keep parts 9, 11, 12, 13, 14, and 16 as a set. Do not transpose or interchange parts.

57



CRANKCASE BOLTS

1. Crankcase stud bolt, ⅜ x 3¼ in.
2. Right center crankcase stud, 5/16 x 5 in.
3. Crankcase stud, 5/16 x 6 in.
4. Crankcase stud, 5/16 x 5-7/16 in.
5. Crankcase stud, 11/32 x 5-13/16 in.

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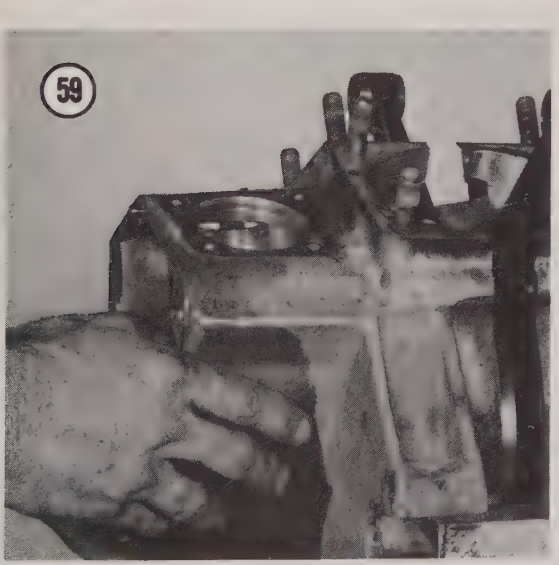

To disassemble crankcase halves, proceed as follows.

1. Remove cylinder heads and cylinders.
2. Remove all gearcase components.
3. Refer to **Figure 57**. Remove crankcase bolts and studs.

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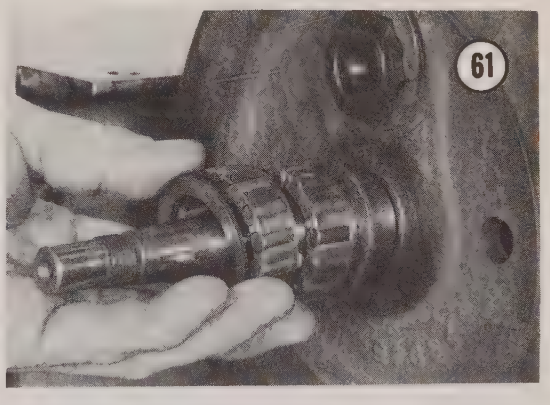


4. Refer to **Figure 58**. Support left crankcase half in a suitable fixture, then tap right crankcase half (1) with a rawhide mallet to loosen it. Pull it directly away from left crankcase half to remove it (**Figure 59**).
5. Remove spiral lock ring (**Figure 60**) from pinion shaft. A small screwdriver may be used to pry it loose.
6. Remove bearing washers, bearing retainers, and bearings from pinion shaft (**Figure 61**).
7. On 1968 and earlier models, remove the spacer (6 in Figure 58).
8. On 1968 and earlier models, clamp pinion shaft end of crankshaft in copper vise jaws, then remove nut (7). Tool 97235-55A is available to remove this nut. Note that it has a left-hand thread.

9. On models with alternators, remove rotor (**Figure 62**) using a suitable puller.

10. Press out crankshaft, using an arbor press or other suitable device (**Figure 63**).

11. On 1968 and earlier models, remove the snap ring (10).

12. On 1968 and earlier models, press out races (12 and 14) and spacer (15). Tool 97194-57 is available to make this job easier.

13. On 1969 and later models, tap out the races (12A and 14A), using a brass drift. If bearings are to be replaced, remove spacer (13A). Rotate lock ring until one end is near oil hole, then insert a pointed tool into hole to start lock ring.

CRANKSHAFT

Crankshafts operate under conditions of high stress. Dimensional tolerances are critical. It is necessary to locate and correct crankshaft discrepancies early to prevent more serious trouble from occurring later.

Figure 64 is an exploded view of a crankshaft assembly. Refer to that illustration during disassembly and service.

Disassembly

1. Using a suitable puller, remove sprocket shaft bearing (**Figure 65**).

2. Hold crankshaft assembly in soft vise jaws with shafts vertical.

3. Remove lock plate screw, lock plate, and nut (**Figure 66**).

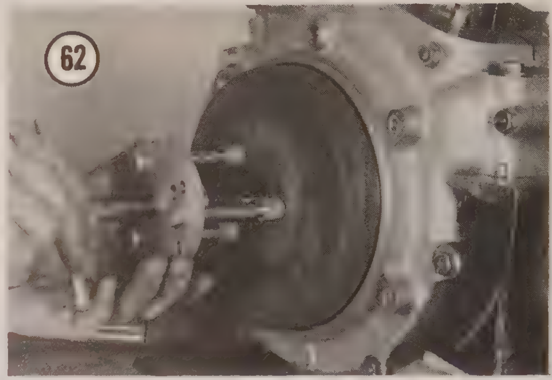
4. Strike upper crank wheel on rim about 90 degrees from crankpin.

5. Remove upper crank wheel (**Figure 67**).

6. Hold bearings down with any convenient tool, then pull off connecting rods together (**Figure 68**).

7. Remove bearings (**Figure 69**). Keep them assembled as a set.

8. Remove remaining lock plate screw, lock plate, and crankpin nut. Tap crank wheel and press out crankpin.



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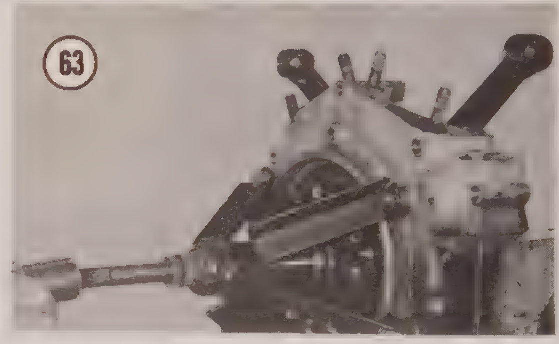

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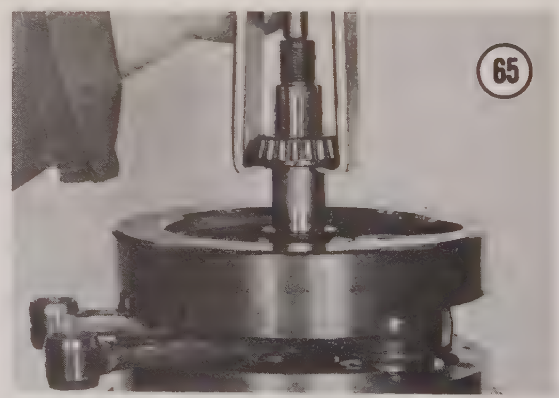

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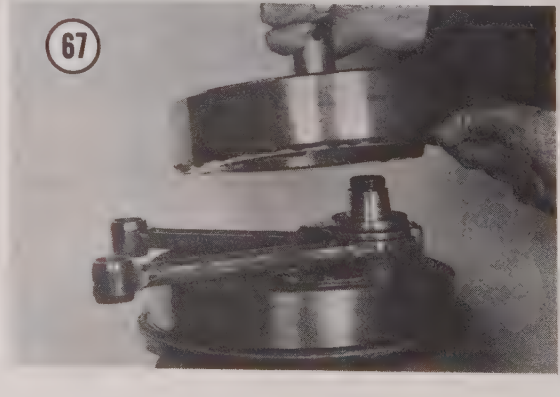

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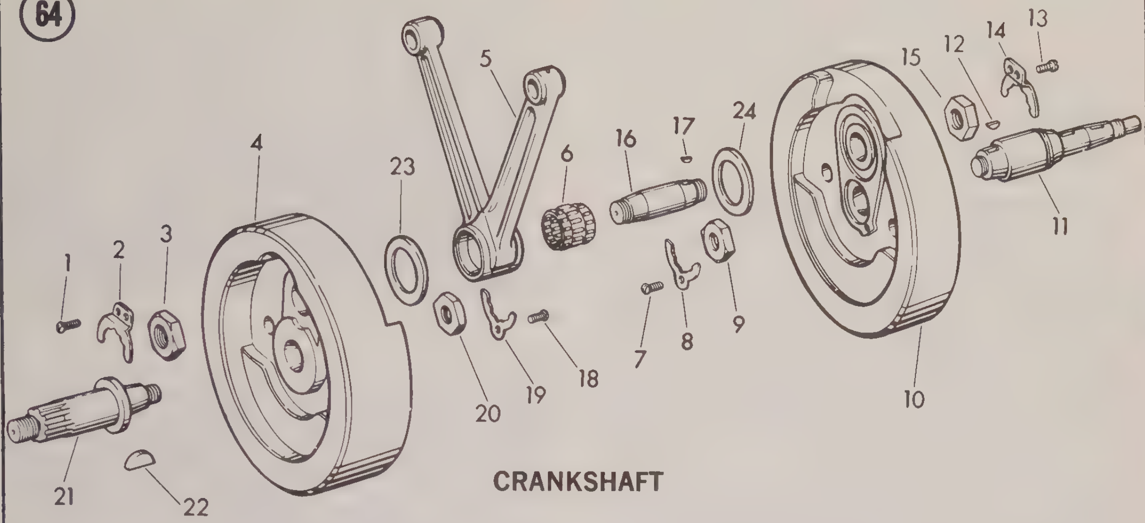
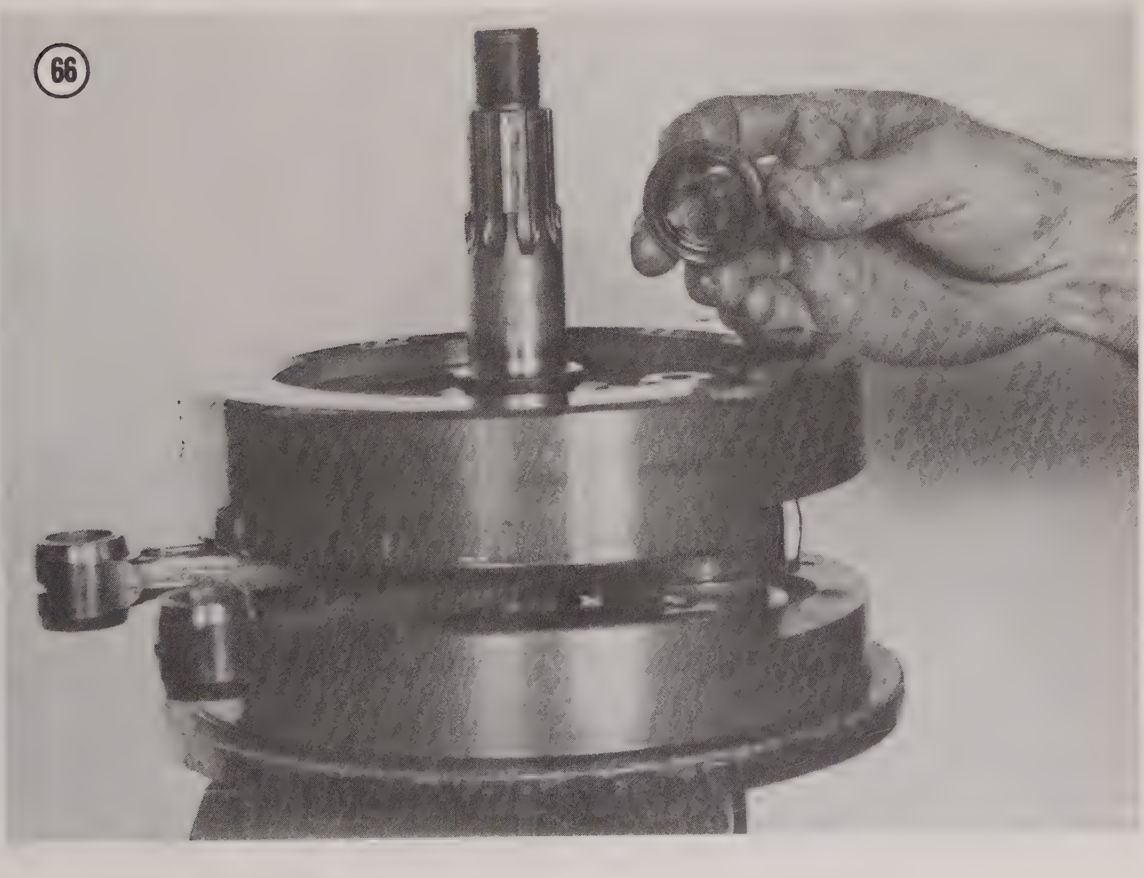


CRANKSHAFT

1. Lock plate screw
2. Lock plate
3. Crank pin nut
4. Left flywheel
5. Connecting rods (one forked, one single end)
6. Bearing rollers and retainers
7. Lock plate screw
8. Lock plate
9. Gear shaft nut
10. Right flywheel
11. Pinion shaft
12. Pinion shaft key
13. Lock plate screw
14. Lock plate
15. Crank pin locknut
16. Crank pin
17. Crank pin key
18. Lock plate screw
19. Lock plate
20. Sprocket shaft nut
21. Sprocket shaft
22. Sprocket shaft key
23. Flywheel washer
24. Flywheel washer

66



Inspection

1. Clean all parts in solvent, then dry.
2. Examine crankpin for wear. If any is evident, replace it.
3. Replace both flywheel washers if either shows evidence of wear.
4. Examine connecting rod big end bearing surfaces. If they are only slightly grooved or shouldered, they may be lapped oversize and have oversize rollers installed. If they are badly worn or pitted, install new connecting rods, bearings, and crankpin.
5. Examine right crankcase bushing and pinion shaft for pitting or roughness. A worn shaft must be replaced.
6. Examine sprocket shaft bearing outer races for wear or roughness. If replacement is necessary, replace bearings as a complete set.

Rod Bearings

There are several methods for fitting rod bearings. Perhaps the easiest is as follows.

1. Fit any size rollers into races. All components must be free of oil.
2. Position assembled bearings into rods.
3. Drop crankpin through hole. Crankpin should not be assembled into crank wheel. Plug fit is achieved when crankpin slides through hole of its own weight. Try different roller oversizes until this condition is obtained. Running fit (0.001 in. desired) may then be determined by subtracting ½ of running clearance from oversize of rollers required to obtain plug fit.

Example:

> Plug fit is obtained with 0.0009 in. oversize rollers. Subtracting ½ of running clearance (0.0005 from 0.0009), it is determined that 0.0004 in. oversize rollers are required to obtain 0.001 in. running fit.

If lower end race of one rod is slightly different from that of the other, select rollers to fit the larger, then lap the smaller rod to the same size as that of the larger.

4. Check overall width of roller retainer assembly. It must measure less than female rod big end width.

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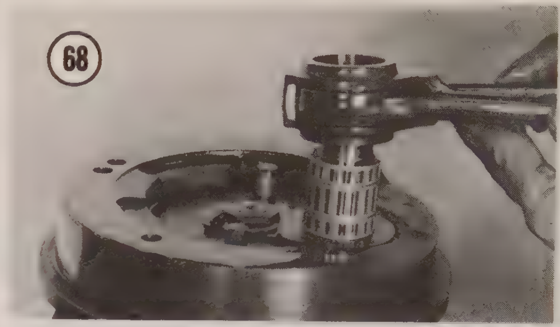

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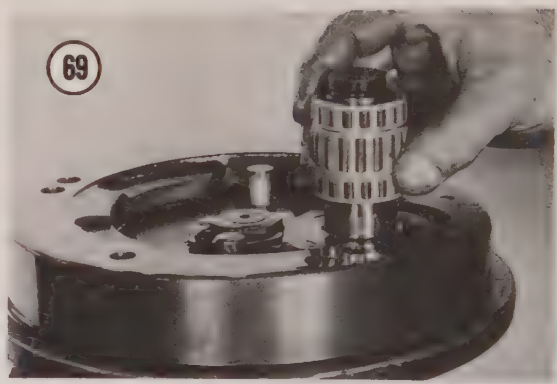

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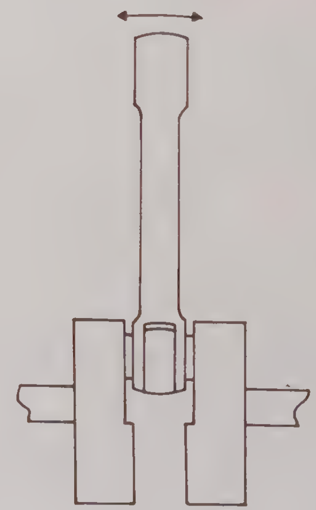


0.025-0.031 in. upper end side shake. Do not mistake lower end side play for upper end side shake.

5. When rods are correctly assembled, extreme upper end of male rod will have approximately 0.025-0.031 in. side shake (**Figure 70**). Side shake in female (forked) rod will be barely perceptible. Bearings, rods, and crankpin must be dry during this check.

Crankshaft Assembly

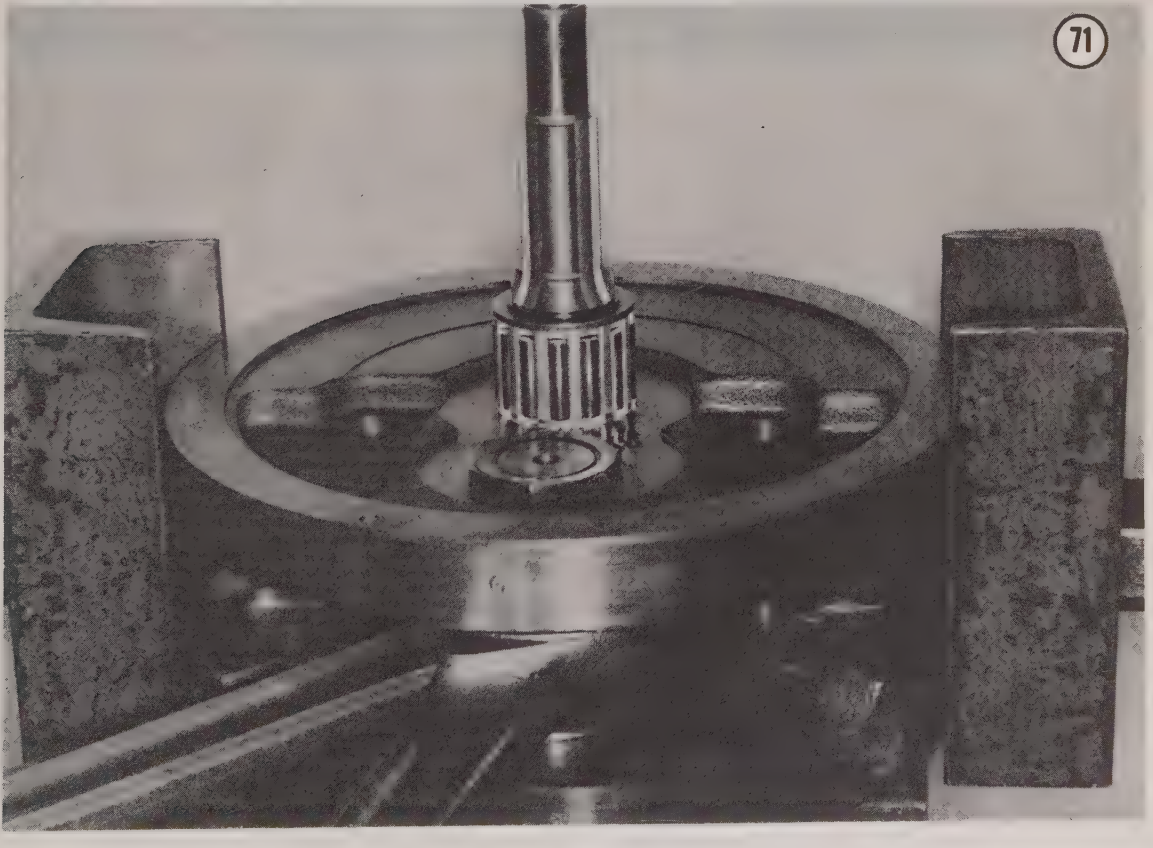
1. Reverse the disassembly procedure to assemble the crankshaft. During assembly, roughly align both crank wheels, using a suitable alignment jig (**Figure 71**) at approximately 90 degrees from crankpin. Use brass or lead mallet to roughly align crank wheels as crankpin nut is tightened.

2. Be sure that female rod goes to rear cylinder.

3. Install flywheel assembly in a lathe or other suitable centering device (**Figure 72**). Adjust centers so that they are just snug, but will still allow crankshaft to turn.

4. Rotate crankshaft assembly through several revolutions, and observe both indicators. One of several indications will be observed.

a. Neither dial indicator needle begins its swing at the same time, and the needles will move in opposite directions during part of the crankshaft rotation cycle. Each needle will probably indicate a different amount of total travel. This condition is caused by eccentricity (both crank wheels not being on the same center), as shown in **Figure 73**. To correct this situation, slowly rotate the crankshaft assembly until the sprocket dial gauge indicates its maximum. Mark the rim of the sprocket side crank wheel at the point in line with the plungers on both dial gauges. Remove the crankshaft assembly from the jig, then, while holding the pinion side crank wheel in one hand, strike the chalk mark a sharp blow with a brass or lead mallet (**Figure 74**). Recheck alignment after each blow, and continue this procedure until both of the dial gauges begin and end their swings at the same time.



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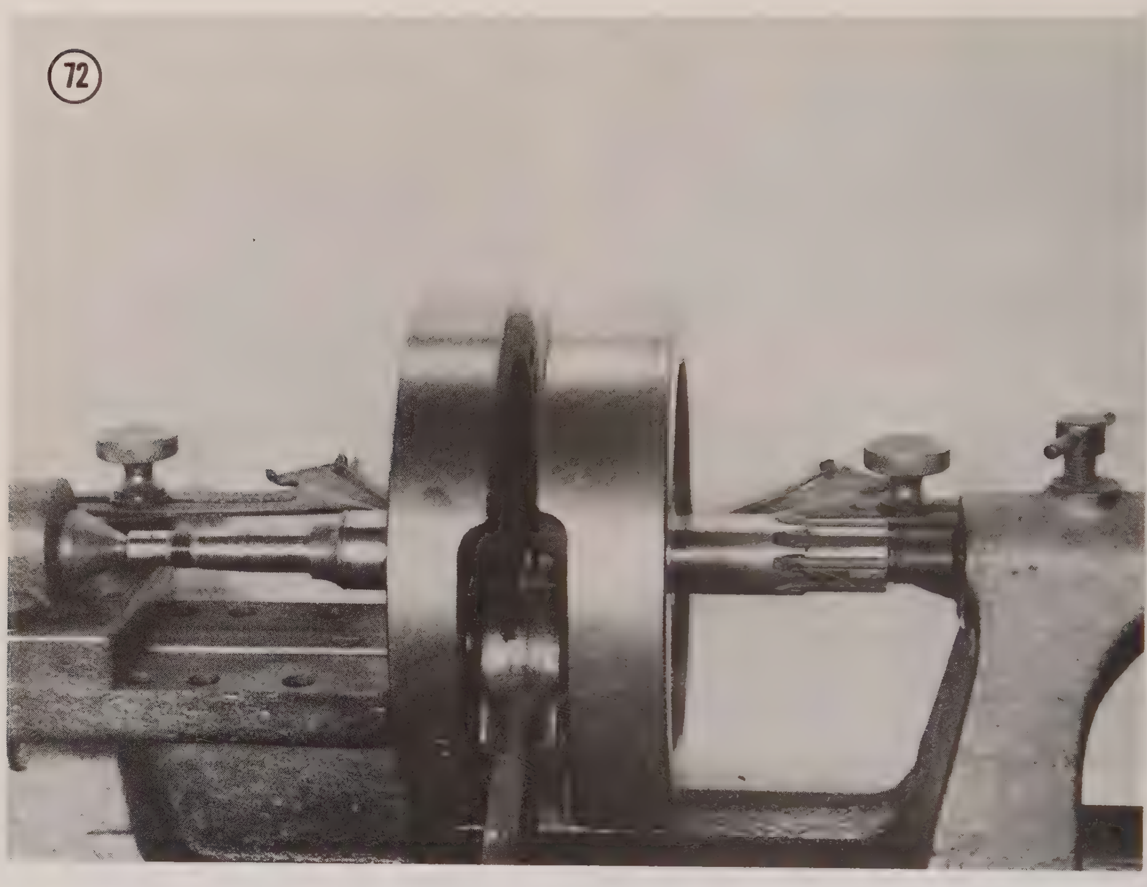

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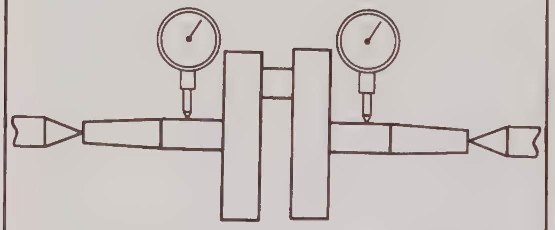
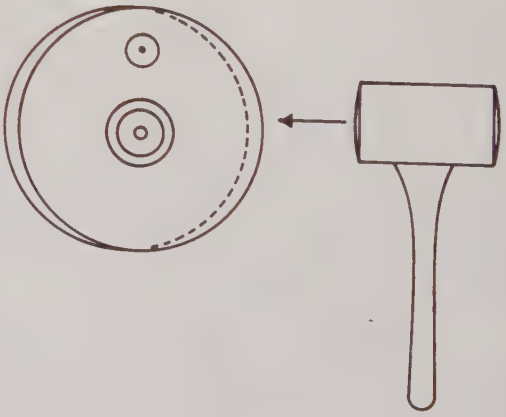
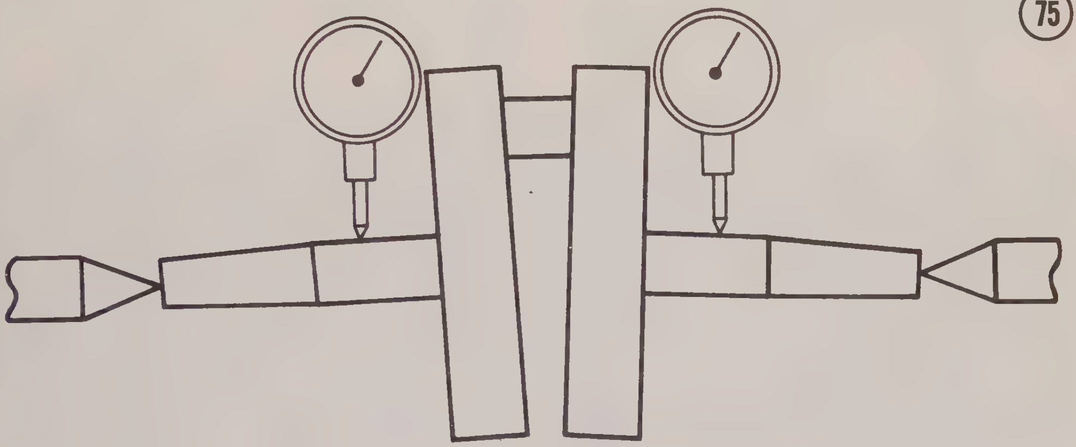

CRANK WHEELS NOT ON COMMON CENTER

(74)

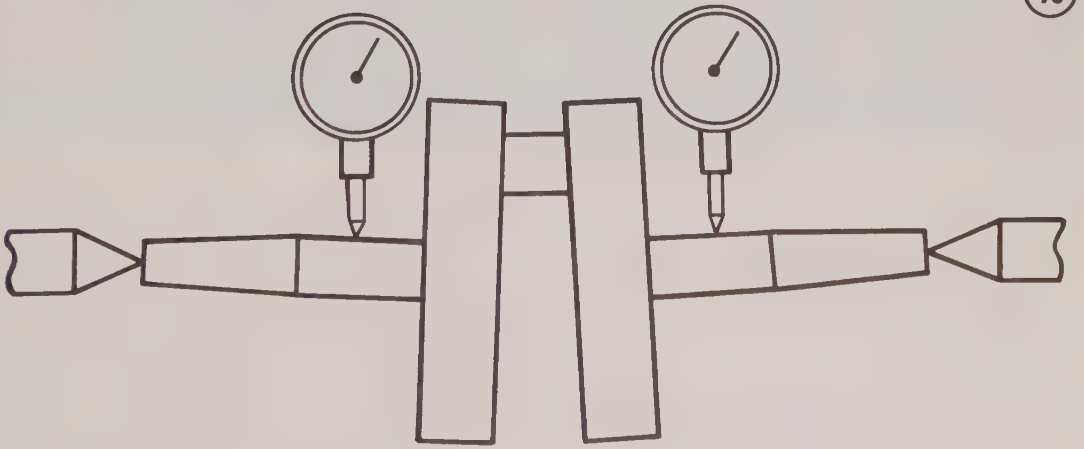


b. After the foregoing adjustment is completed, the crank wheels may still be pinched, as shown in **Figure 75**, or spread (**Figure 76**). Both dial indicators will indicate maximum travel when the crankpin is toward the dial gauges if the crank wheels are pinched. Correct this condition by removing the crankshaft assembly, then drive a wedge or chisel between the 2 crank wheels at a point opposite maximum dial gauge indication. Recheck alignment after each adjustment. Continue this procedure until the dial gauges indicate no more than 0.001 in. runout on each side.

If the dial gauges indicated their maximum



CRANK WHEELS PINCHED TOGETHER



CRANK WHEELS SPREAD APART

when the crankpin was on the side of the alignment test jig away from the dial gauges, the crank wheels are spread. Correct this condition by tapping the outside of one of the wheels toward the other with a brass or lead mallet. Recheck alignment after each blow. Continue adjustment until runout is within the tolerance specified in the foregoing paragraph.

> NOTE: *It may be necessary to repeat the correction for eccentricity during the correction procedure for pinch or spread.*

If it is not possible to align the crankshaft assembly, check for cracked crank wheels, enlarged crankpin holes, or shafts that are worn out-of-round.

After alignment is complete, mount crankshaft assembly in a vise, then torque both crankpin nuts to 175 ft.-lb. Check side clearance between rear cylinder connecting rod and crank wheel. Clearance after assembly must be 0.006 to 0.010 in. If clearance is greater, tighten crankpin nuts until side clearance is within specifications. If insufficient clearance exists, check the following items.

1. Crankshaft may have been assembled with oil on tapered portions of crankpin and/or oil in tapered holes in crank wheels, then crankpin nuts overtightened. To correct this condition, disassemble crankshaft, clean tapered crankpin ends and crank wheel holes, then reassemble without oil.

2. Replacement flywheel washers not fully seated. In this case, replace crank wheel which seats deeper. In extreme cases, grind rear connecting rod.

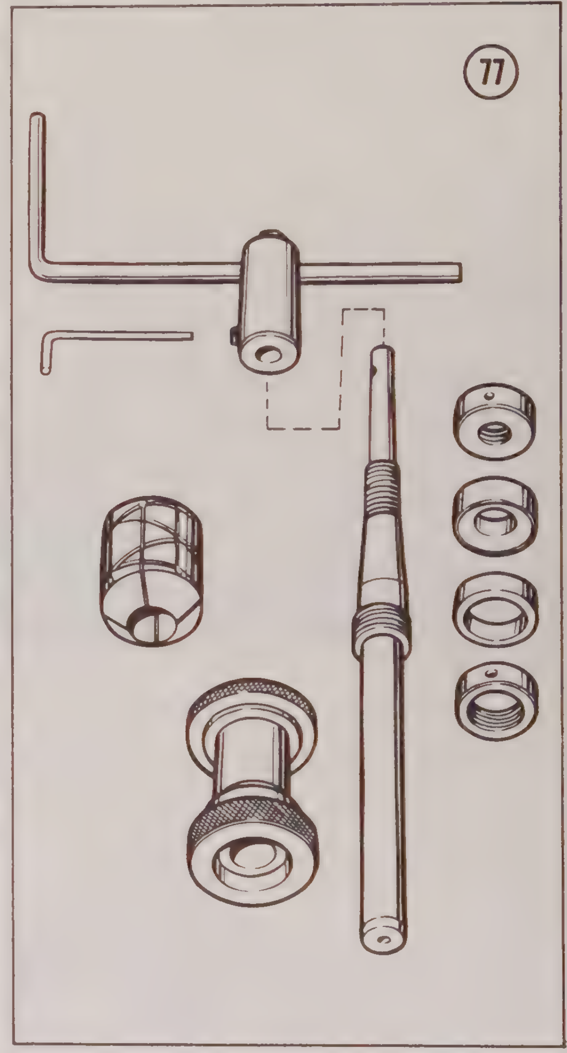
> NOTE: *If connecting rod is ground, it is necessary to grind backs of bearing retainers so that they remain narrower than front cylinder connecting rod.*

3. Crank wheel cracked at crankpin hole. Replace crank wheel if this condition exists.

4. Crankpin holes enlarged. This condition is not likely to exist unless crankshaft has been disassembled repeatedly. Replace crank wheel which seats deeper to correct this condition.

PINION SHAFT MAIN BEARING

It is necessary to lap bearing race in crankcase before fitting new pinion shaft bearings. Lapping tool 96710-40 is available for this job (**Figure 77**). To lap bearing, proceed as follows.



1. Assemble left and right crankcase halves, holding them together with top center and both lower studs.

2. Install sprocket bearing outer races and large spacer.

3. Assemble lapping tool.

4. Insert tool shaft through pinion bearing bushing and into guide sleeve.

5. Tighten collars until arbor begins to drag. Do not adjust arbor snug in bushing.

6. Withdraw arbor enough to coat it lightly with fine lapping compound.

7. Reposition tool (**Figure 78**), then turn handle at moderate speed. Move tool in and out as it is turned.

8. Inspect bushing at frequent intervals. Continue lapping until a dull satin finish is obtained.

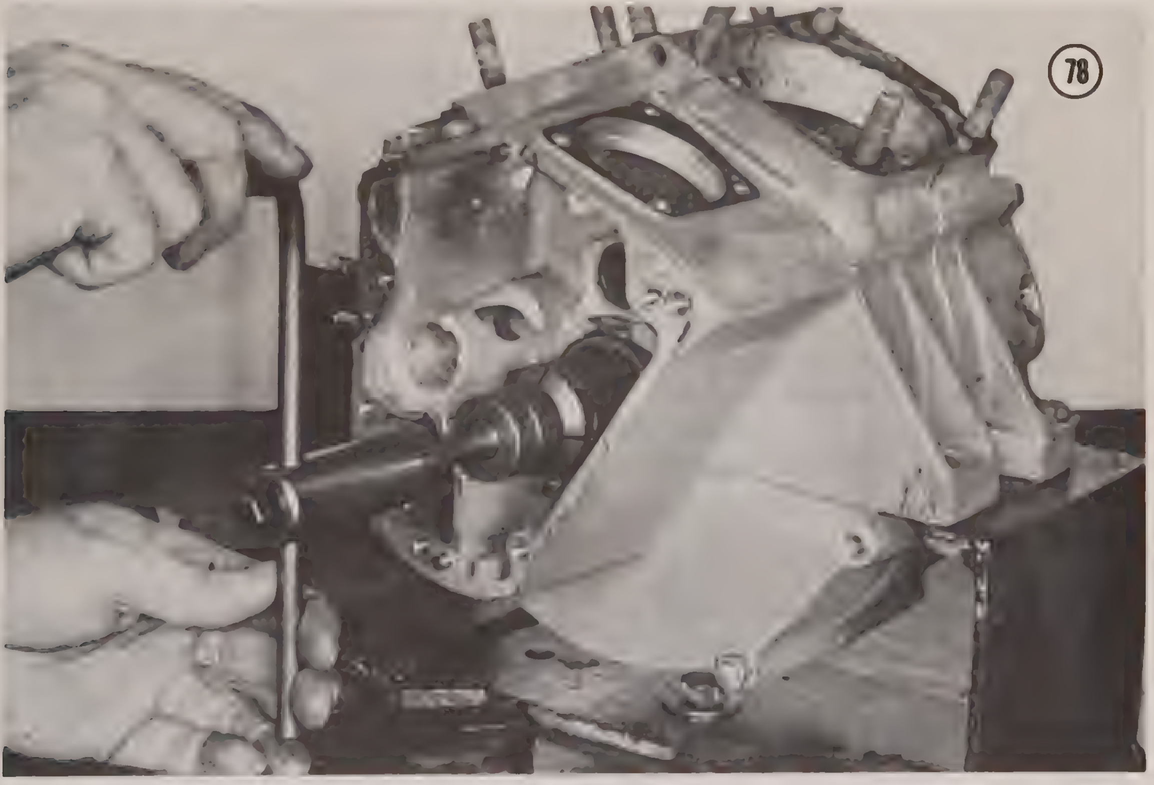
10. Remove all lapping compound with solvent.

11. If race is worn beyond limits of oversize bearings, replace it. Refer to following *Pinion Shaft Bearing* section.

To replace bearing, heat crankcase half to 275-300°F, then press old race out and new race in. New race must be lapped in slightly.

PINION SHAFT BEARING

Fit pinion shaft bearings in much the same manner as that of connecting rod bearings. Rollers are available in oversizes of 0.002, 0.004, 0.0006, 0.0008, and 0.0010 in. All fitting must be done with bearings dry.



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NOTE: If you own a 1976 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER FOUR

PRIMARY DRIVE, CLUTCH, AND TRANSMISSION

On all models covered by this book, primary reduction is accomplished by an engine sprocket, a ½-in. pitch double roller chain, and a second sprocket which is part of the clutch shell. Most models are equipped with 4-speed transmissions; on a few machines, a reverse gear replaces a forward one.

CLUTCH

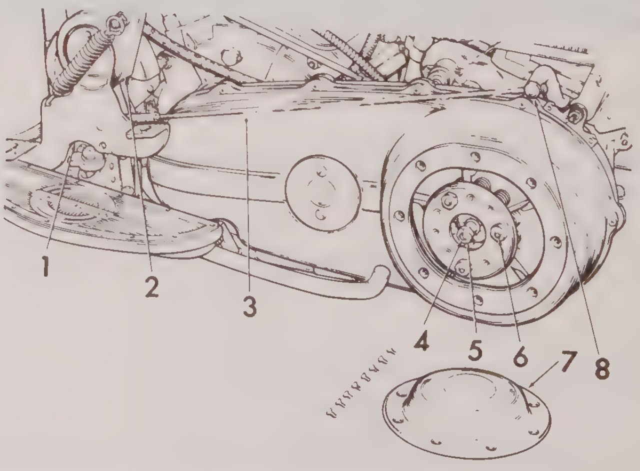
Harley-Davidson clutches are of multiple disc construction with alternate plates splined to the clutch hub and clutch shell. When the clutch is engaged, springs force all plates together, causing them to turn as a unit, thereby transmitting engine power to the transmission and rear wheel.

Adjusting Foot Clutch Control

Refer to **Figure 1**, then proceed as follows.

1. With heel of foot pedal (1) fully down (clutch disengaged), clutch lever (8) should just touch transmission cover.
2. Adjust length of rod (3) so that it just clears bearing cover (2), so that rod is not bent by bearing cover.

①



1. Foot pedal
2. Foot pedal bearing cover
3. Clutch lever rod
4. Pushrod adjusting screw
5. Pushrod adjusting screw locknut
6. Spring tension adjusting nuts
7. Clutch cover
8. Clutch release lever

3. On 1964 and earlier models, remove the cover (7).

4. On 1965 models, remove chain housing cover.

5. Move pedal (1) to fully engaged position (toe down).

6. Loosen locknut (5), then turn adjusting screw (4) so that end of clutch lever has about ⅛ in. free movement before clutch disengages. On 1964 models, clutch lever should strike transmission cover. On 1965 models, there should be ¼ in. clearance between clutch lever and starter drive housing.

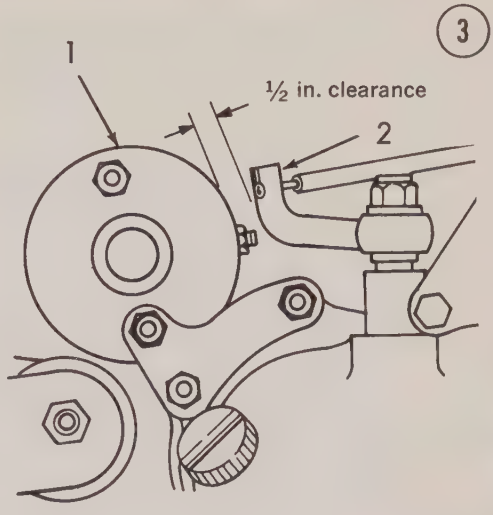
Hand Clutch Control Adjustment (1968 and Later Models)

Refer to **Figure 2**, then proceed as follows.

1. Loosen locknut (2).
2. Turn threaded sleeve (1) as required to produce approximately ¼ in. free movement of clutch hand lever before clutch starts to release.
3. Tighten locknut (2).

If sleeve adjustment has all been taken up, make the following adjustments. See **Figure 3**.

1. Move lever on transmission forward, taking up all slack.
2. Measure clearance between starter motor (1) and clutch release lever (2). Clearance should be ⅜ to ⅝ in.
3. If not correct, loosen locknut (2 in Figure 2), then turn sleeve (1 in Figure 2) all the way into its bracket.



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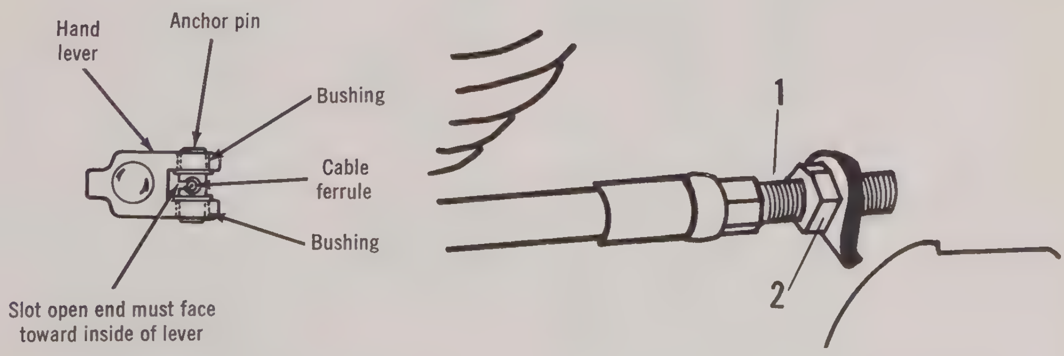
4. Remove chain housing cover.
5. Loosen pushrod screw locknut (5 in Figure 1).
6. Turn pushrod adjusting screw (4 in Figure 1) as required until proper clearance exists between clutch release lever and starter motor.
7. Tighten locknut.
8. Install cover.

> NOTE: *Chain housing must be air tight. Always use a new gasket and gasket seater.*

9. Adjust clutch hand lever free movement as described earlier.



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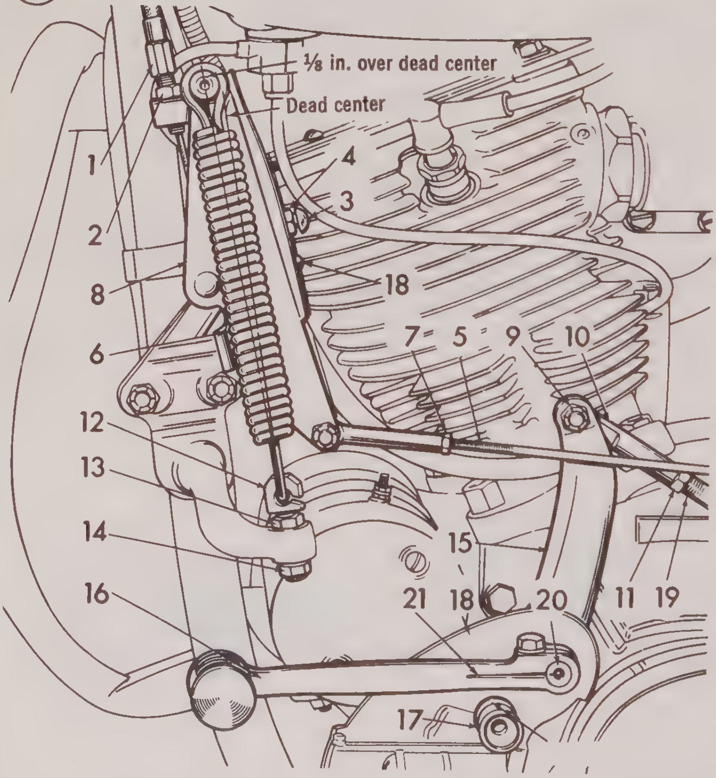
Hand Clutch Booster Adjustment

Always check booster adjustment when hand lever operation becomes difficult, or if improper clutch operation is indicated. Refer to **Figure 4**.

1. Loosen locknut (7).
2. Adjust rod (5) so that lever on transmission has about ½ in. free movement. Move lever forward until all slack in mechanism is taken up.
3. On 1964 and earlier models, distance between outer edge of chamfered slot in lever (1) and foot shifter housing on transmission should be 4¼ in. On 1965 and later models, distance between chain housing and clutch lever rod should be ¼ in. If adjustment is required, continue with Steps 4 through 20.
4. Remove clutch cover or chain cover, as applicable.
5. Loosen pushrod screw locknut.
6. Turn adjusting screw as required so that distance is as specified in Step 3.
7. Tighten locknut.
8. Loosen locknut (2).
9. Turn adjusting sleeve (2) until there is about one inch play at clutch hand lever.
10. Loosen locknut (4).
11. Turn adjusting screw (3) until bellcrank (8) does not cross top dead center when moved back and forth by hand.
12. Loosen upper adjusting nut (13) as far as it will go.
13. Turn screw (3) a little at a time until bellcrank moves over top dead center and remains in that position when released. Do not move bellcrank with clutch lever; move it by hand. Bellcrank should lock in position about ⅛ in. past top dead center.
14. Tighten locknut (4).
15. Adjust rod (5) so that there is 1/16 in. free movement of clutch actuating lever.
16. Tighten locknut (7).

④



HAND CLUTCH BOOSTER ADJUSTMENT

1. Control coil adjusting sleeve
2. Control coil adjusting sleeve locknut
3. Bellcrank adjusting screw
4. Bellcrank adjusting screw locknut
5. Clutch lever rod
6. Clutch control booster spring
7. Clutch lever rod locknut
8. Clutch control booster bellcrank
9. Shifter rod end bolt
10. Shifter rod end
11. Shifter rod end locknut
12. Clutch booster spring tension adjuster
13. Clutch booster spring tension upper adjuster nut
14. Clutch booster spring tension lower adjuster nut
15. Gear shifter lever
16. Gear shifter foot lever and rubber pedal
17. Foot lever cover mounting stud (1964 and earlier models)
18. Grease fittings
19. Shifter rod
20. Foot lever positioning mark
21. Foot lever clamping slot

17. Turn sleeve (1) until there is ½ in. free movement of hand lever before clutch starts to disengage.

18. Tighten locknut (2).

19. Pull clutch hand lever in fully. Tighten adjusting nut (14) until lever remains in. Then slowly loosen adjusting nut (14) until clutch hand lever returns to its released position.

20. Tighten nut (13).

Adjusting Clutch Spring Tension

If, after adjusting clutch controls, clutch still slips, increase clutch spring tension. Refer back to Figure 1. Tighten each nut (6) ½ turn at a time until clutch does not slip when engine is cranked. Do not increase tension any more than necessary. If springs are compressed to ⅞ in. or less before clutch holds, overhaul clutch.

Clutch Removal

Figure 5 is an exploded view of a typical clutch assembly. Refer to that illustration while servicing clutch.

1. Remove chain housing cover or outer chain guard. Be prepared to catch oil as it drains out.

2. Remove locknut (1).

3. Place a 1¾ in. washer over adjusting screw (21), then replace locknut (1).

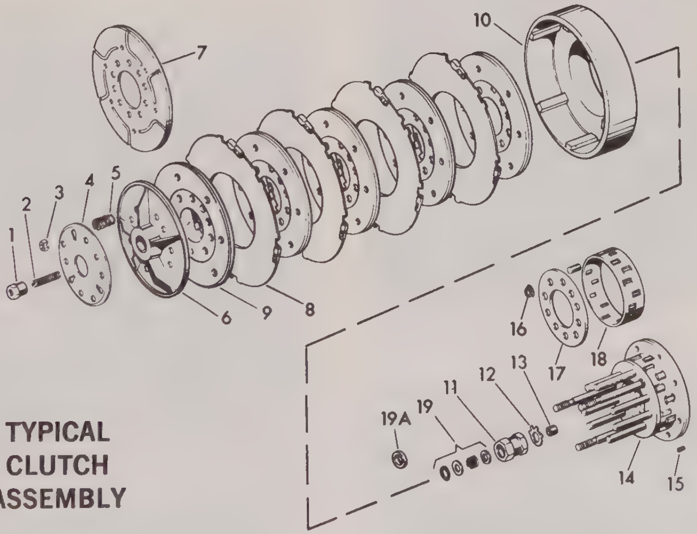
4. Turn down locknut (1) until nuts (3) are free. Remove nuts (3).

5. Remove nut (1) and washer.

6. Remove collar (4), springs (5), and pressure plate (6). Do not disassemble these parts unless it is necessary to do so for replacement.

7. Remove the spring disc (7) on models so equipped.

⑤



TYPICAL
CLUTCH
ASSEMBLY

1. Pushrod adjusting screw locknut
2. Adjusting screw
3. Spring tension adjusting nut
4. Spring collar
5. Springs
6. Pressure plate
7. Spring disc (1967 and earlier)
8. Steel disc
9. Friction disc
10. Clutch shell
11. Clutch hub nut
12. Hub nut lockwasher
13. Pushrod cork oil seal (1964 and earlier)
14. Clutch hub
15. Clutch hub key
16. Bearing plate spring
17. Bearing plate
18. Bearing retainer
19. Hub nut seal parts (1964 and earlier)
19A. Hub nut seal (1965 and later)

8. Remove clutch discs (**Figure 6**).

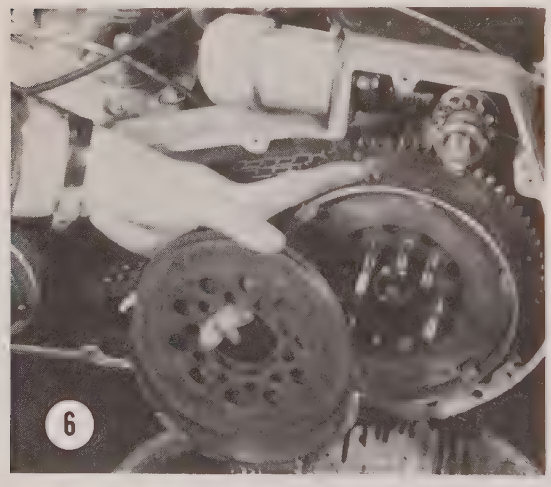
9. Remove engine sprocket or compensating sprocket (**Figure 7**).

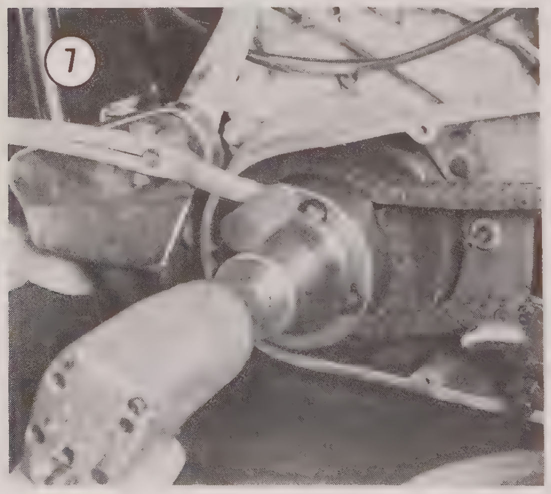
10. Remove clutch shell (10) and primary chain (**Figure 8**).

> *NOTE*
> *On 1970 and later models, note the number and the thickness of the spacers between the alternator rotor hub and the splined shaft extension. Be sure to install them exactly as removed.*

11. Flatten lockwasher tab, then remove clutch hub nut (**Figure 9**). Note that this nut has a left-hand thread.

12. Remove lockwasher (12) and, on models so equipped, oil seal (13).



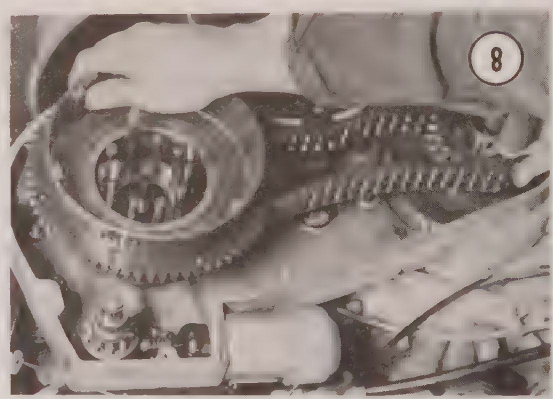


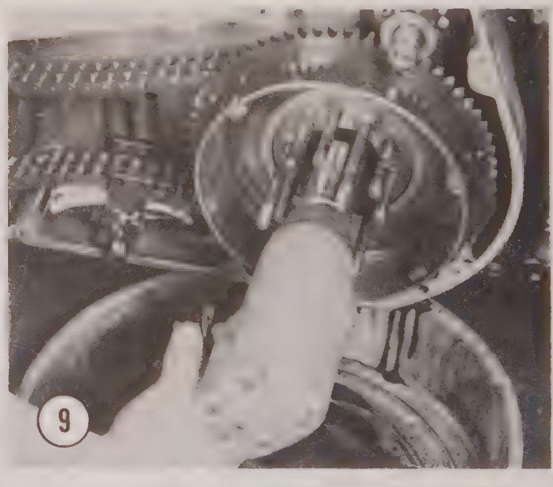
13. Remove clutch hub (**Figure 10**). Tool 95960-41A is available for this job.

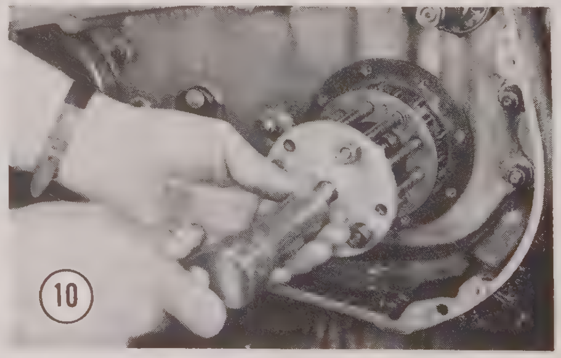
14. Remove key (15).

Inspection

1. Clean all parts except friction discs in solvent, then blow dry. Pay particular attention to condition of friction discs. Replace all discs if any of them exhibit the following symptoms.







- a. Glazing, evidenced by a smooth, shiny appearance, or occasionally by darkening.
- b. Lining worn down to rivets.
- c. Linings chipped or cracked.
- d. Worn or grooved friction surfaces.
- e. Oil-soaked linings.

2. Replace steel discs if they are warped or grooved. Press steel disc buffers down with fingers; replace them if they do not snap back when released.

3. Operate clutch hub roller bearing. If it feels rough, replace hub.

4. Compress each clutch spring to the length specified in **Table 1**, then measure minimum tension, using a suitable tester. Also measure free length. Replace all springs if any one is not within specifications, or if any one is shorter than the free length specified.

Table 1 CLUTCH SPRING SPECIFICATIONS

Model	Length	Tension
1967 and earlier	1-1/8 inches	42-52 pounds
	1-31/64	Free
1968 and later	1-1/4 inches	30-38 pounds
	1-45/64	Free

Clutch Installation

Clutch installation is essentially the reverse of removal and disassembly procedure. Observe the following notes.

1. Be sure steel discs are installed so that side marked OUT is outward.

2. Grease the clutch shell bearing before installation.

3. Tighten stud nuts evenly until distance from back of pressure plate to front of releasing disc is 31/32 in. for 1967 and earlier models, and 1-1/32 in. for 1968 and later models.

4. Adjust clutch controls as described earlier.

ELECTRIC STARTER DRIVE

Figure 11 is an exploded view of starter drive components. Refer to that illustration during disassembly and service. Starter motor service is detailed in Chapter Six.

Solenoid Disassembly

1. Disconnect battery ground cable at battery negative terminal.

2. Remove cover (1).

3. Disconnect nuts and lockwashers (2 and 3) to remove solenoid wiring.

4. Remove chain housing cover.

5. Press retainer cap (4) inward, then remove pin (5) from hole in shaft.

6. Remove spring (6).

7. Remove solenoid bolts (7) and spacer (8).

8. Remove solenoid (13) together with boot (9), gasket (10), plunger (11), and spring (12).

Starter Drive Shaft and Housing Disassembly

1. Remove solenoid as described in foregoing Steps 1 through 8.

2. Pull lever (25) forward, then disconnect lever fingers from collar (20).

3. Pull pinion gear and shaft assembly (14) from housing. Gear (27) will remain in housing (28).

4. Remove thrust washer (15).

5. Clamp nut (16) between copper jaws in a vise, then remove it from shaft. Note that this nut has a left-hand thread.

6. Remove pinion gear assembly (17).

7. Remove snap ring (18), then separate gear (19) and collar (20).

8. Remove snap ring (21) or spacer (21A) from shaft (22).

9. It is necessary to first remove oil tank or inner chain housing if lever (25) is to be removed. Then remove screw (24).

10. Remove nuts and lockwashers (23) to remove starter motor and housing.

11. Remove oil deflector (26) and gear (27) from housing (28).

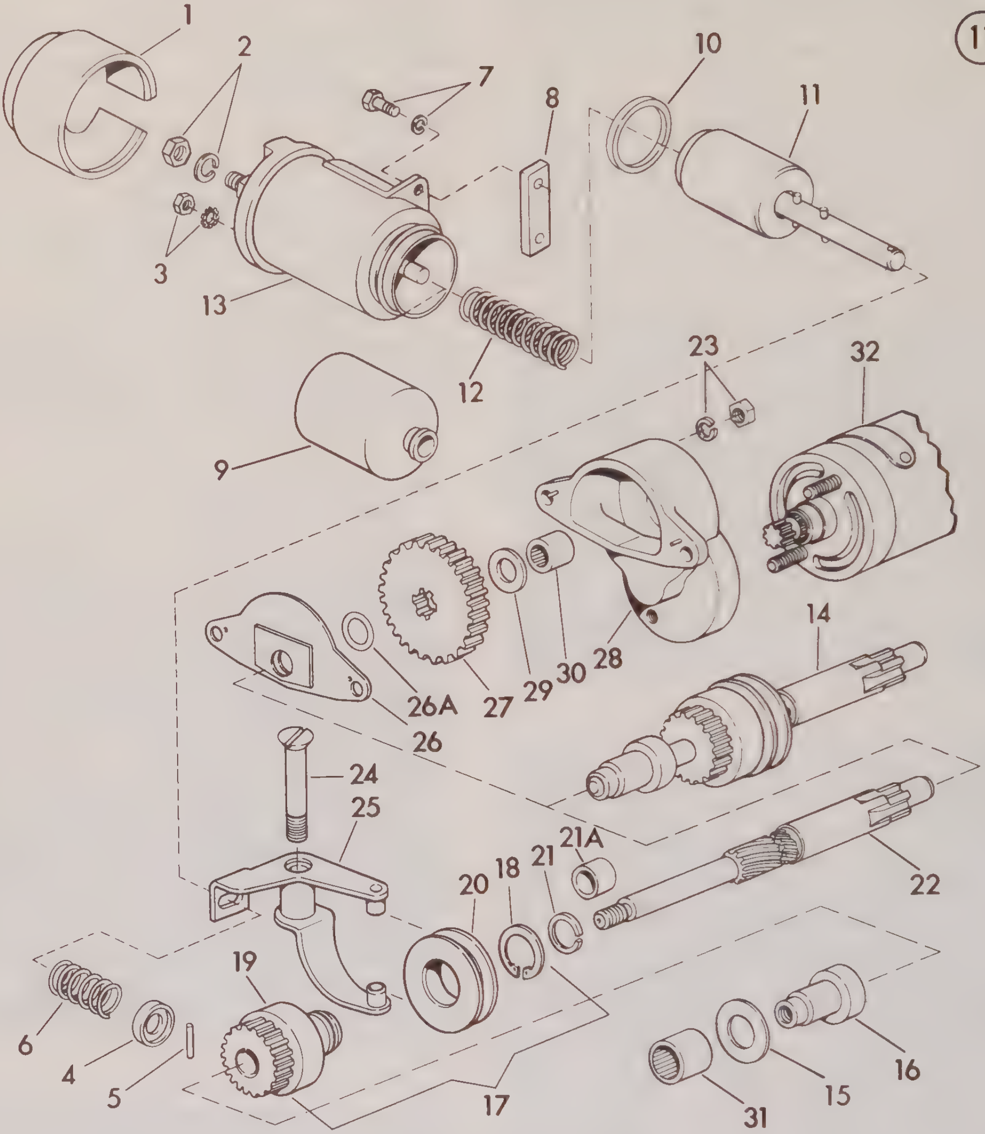
12. Press out bearings (30 and 31). Washer (29) will come out with bearing (30).

Starter Drive Shaft and Housing Installation

Installation is generally the reverse of removal and disassembly.

Observe the following notes.

11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24
25
21A
20
18
21
22
19
6
4
5
17
31
15
16

ELECTRIC STARTER DRIVE
(FL/FLH/FX)

1. Cover
2. Terminal nut and lockwasher
3. Terminal nut and lockwasher
4. Retainer cap
5. Pin
6. Spring
7. Bolt and lockwasher
8. Spacer bar
9. Boot
10. Gasket
11. Plunger
12. Plunger spring
13. Solenoid
14. Pinion gear and shaft assembly
15. Thrust washer
16. Pinion shaft nut
17. Pinion and shifter collar assembly
18. Lock ring
19. Pinion gear
20. Shifter collar
21. Lock ring (early 1965)
21A. Spacer (late 1965)
22. Shaft
23. Nut and lockwasher
24. Shifter lever screw
25. Shifter lever
26. Oil deflector
26A. Oil deflector O-ring (late 1965)
27. Drive gear
28. Starter shaft housing
29. Washer
30. Needle bearing
31. Needle bearing
32. Starter motor

1. Clean needle bearings (30 and 31). Replace them with fresh grease before installation.
2. Press bearing (30) in until it is flush with outside of housing.
3. Stake washer (29) into position.
4. Do not apply any lubricant to worm threads of pinion (19) and shaft (22).
5. Use thread lock cement on shaft nut (16).
6. Be sure to connect battery cable to *longer* solenoid terminal.

KICKSTARTER

Figure 12 is an exploded view of a Harley-Davidson kickstarter. Refer to that illustration during disassembly and service.

Kickstarters are simple, rugged devices that will seldom require service. However, if any mechanical irregularity should develop, it is of utmost importance that the engine be turned off and kickstarter mechanism repaired before returning the bike to service.

Kickstarter Removal

1. Remove nuts (1) and washers (2). Be prepared to catch oil as it drains.
2. Remove clutch lever rod from left end of clutch release lever.
3. Pull cover (11) from its mounting studs. Clutch release bearing (3) should come out with cover. If cover binds, pry bearing from starter clutch. Do not pry cover.
4. Pull rod (4) from main shaft.
5. Clamp crank (8) in a vise, then remove nut (5) and lockwasher (6).
6. Using a suitable puller, remove gear (7).
7. Remove crank (8) from cover. Note how the chamfered side of the trust washer (9) faces the spring (10).
8. Remove nut (12) and lockwasher (13), then separate release lever (14) from shaft (15), using a suitable puller.
9. Remove cotter pin (16) and washer (17). Pull shaft (15) out of cover.
10. Remove release finger (18) and thrust washer (19).

Inspection

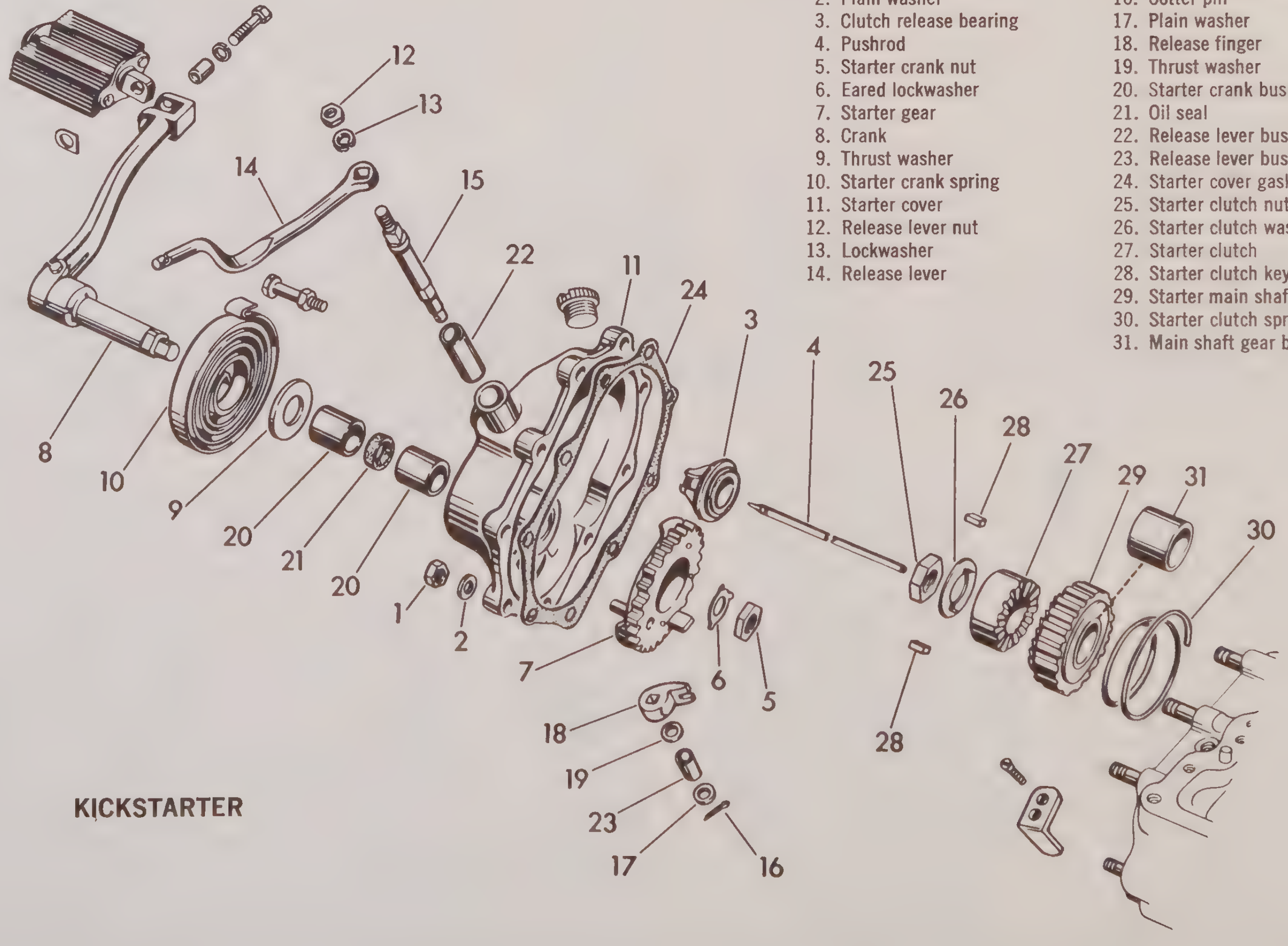
Clean all parts thoroughly in solvent, then dry with compressed air. Note the following items, in addition to checking for obvious broken or badly worn parts.

1. Replace bushings (20) if starter crankshaft is loose in cover.
2. Replace oil seal (21) if old seal leaks.
3. Replace bushings (22 and 23) if release lever shaft is loose.
4. Replace pushrod bearing if it is loose, grinds, or feels rough.
5. Be sure that crank gear cam plate and gear pin are in good condition.

Kickstarter Installation

1. Install release lever shaft (15) and release finger (18) into cover (11) with thrust washer (19) between finger and bushing (23). Install washer (17) and a new cotter pin (16) on end of shaft.
2. Install spring (10) and thrust washer (9) onto starter crank (8). Note that chamfered side of washer faces spring. Apply a small quantity of grease to oil seal (21) and end of crankshaft before inserting crankshaft.
3. Hold crank in a vise, then tension spring by turning cover clockwise. With spring wound, install crank gear (7) so that dowel holds crank in its normal position.
4. Install lockwasher (6) and nut (5). Be sure to bend tab on lockwasher up to secure nut.
5. Install a new gasket (24).
6. Install clutch release bearing (3) into cover, with slot in outer bearing race engaging clutch release finger (18).
7. Insert small end of pushrod (4) into clutch release bearing, then start its other end into transmission main shaft.
8. Slide cover assembly into position. Note that groove in clutch release bearing inner race must align with ball plunger in starter clutch.
9. Install cover retaining nuts and washers.
10. Pour in 1½ pints engine oil.

⑫



1. Starter cover nut
2. Plain washer
3. Clutch release bearing
4. Pushrod
5. Starter crank nut
6. Eared lockwasher
7. Starter gear
8. Crank
9. Thrust washer
10. Starter crank spring
11. Starter cover
12. Release lever nut
13. Lockwasher
14. Release lever
15. Release lever shaft
16. Cotter pin
17. Plain washer
18. Release finger
19. Thrust washer
20. Starter crank bushing
21. Oil seal
22. Release lever bushing
23. Release lever bushing
24. Starter cover gasket
25. Starter clutch nut
26. Starter clutch washer
27. Starter clutch
28. Starter clutch key
29. Starter main shaft gear
30. Starter clutch spring
31. Main shaft gear bushing

KICKSTARTER

Starter Clutch Removal

1. Remove cover as specified in Steps 1-5 of foregoing *Kickstarter Removal.*
2. Remove nut (25) and lockwasher (26).
3. Remove starter clutch (27) from main shaft, using a suitable puller. Tool 95650-42 is available for this purpose.
4. Remove keys (28), gear (29), and spring (30).

Inspection

1. Examine teeth on starter gear (29) and starter clutch (27). Teeth should be sharp. Replace starter clutch and gear if teeth are rounded, or if kickstarter has been slipping.
2. Note that clutch may be cracked if nut (25) has been overtightened previously. Difficulty when removing starter clutch from clutch release bearing is a symptom of this condition.
3. Replace bushing (31) in gear (29) if gear is loose on its shaft.

Starter Clutch Installation

1. Coat a new gasket (24) with sealer, then place it in position on transmission.
2. Lubricate main shaft with engine oil, then install spring (30) and gear (29) onto shaft. Note that bushing in gear should be loose enough that spring (30) can slide it along shaft. Ream bushing if necessary.
3. Position starter clutch and install starter clutch keys.
4. Remainder of installation is the reverse of removal.

PRIMARY CHAIN

Primary chain tension should be checked at 2,000-mile intervals. There is no master link on this chain; it is necessary to remove engine sprocket before chain can be removed.

Always replace primary chain if it is worn or damaged. Attempts at repair may result in chain failure and serious engine damage.

Adjustment (1964 and Earlier Models)

1. Loosen 4 nuts and one cap screw which secure transmission.
2. Move transmission as required to adjust chain tension. Adjusting screw is at transmission rear on right side. Up-and-down play in the chain should be ½ in. when the chain is at its tightest point.
3. Tighten transmission retaining hardware.
4. Adjust clutch controls and shifter controls. Refer to the applicable procedures elsewhere in this chapter.
5. Readjust rear chain.

Adjustment (1965 and Later Models)

1. Loosen chain adjustment shoe center bolt.
2. Move shoe support up or down to tension chain. Free vertical movement in chain should be ⅝ to ⅞ in. with engine cold, or ⅜ to ⅝ in. with engine hot.
3. Tighten bolt.

TRANSMISSION

Transmission in all models are similar. Shifter mechanisms are different for models with hand or foot shift control. In a few transmissions an optional reverse gear is available; such transmissions have only 3 forward speeds. Transmission covers and linkage are different for models with foot and hand shift mechanism.

It is normally necessary to adjust hand shift linkage only to compensate for wear or after transmission removal and replacement. Note that on 1964 and earlier models, shift linkage must be adjusted after adjustment of the primary chain.

Adjusting Hand Shift Linkage

1. Move shift lever to 2nd gear position on 3-speed transmissions, or 3rd gear position on 4-speed transmissions.
2. Disconnect shifter rod from shifter lever.
3. Carefully move lever on transmission until shifter spring plunger inside transmission drops into its detent. This position may be determined by feel.
4. Adjust clevis on shift rod until it aligns exactly with hole in shifter lever.
5. Reconnect shifter rod to shifter lever.

Adjusting Foot Shift Linkage

1. Determine that notch or mark in end of foot shifter shaft aligns with clamp slot in shifter lever. There is no mark on FX models.

2. On all but 1974 and later FX models, adjust length of rod by removing shifter rod end bolt, then turning rod end as required. On 1974 and later FX models, adjust threaded ends on rod after removing retainer clip.

3. On 1964 and earlier models, adjust length of shifter rod so that there is about 1/16 in. clearance between foot lever and foot lever cover mounting stand when foot lever is fully depressed. Adjust rod length by turning rod end as required.

Foot Shifter Cover

Figure 13 is an exploded view of this cover. Refer to that illustration during service.

1. Remove 12 screws which retain cover to transmission. Note that one screw (**Figure 14**) is a transmission vent; it must be returned to its original location.

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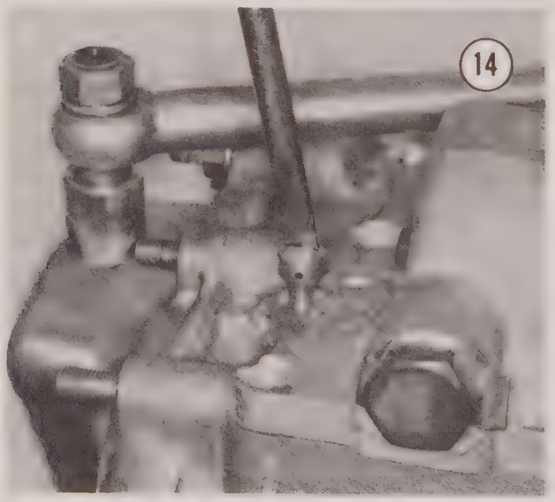

2. Remove cover (**Figure 15**).
3. Remove lever (**Figure 16**).
4. Remove dust shield (**Figure 17**).
5. Remove pawl carrier cover (**Figure 18**) and its gasket. Note that springs (**Figure 19**) are under pressure, and may fly out when cover is removed.
6. Remove pawl carrier (**Figure 20**).

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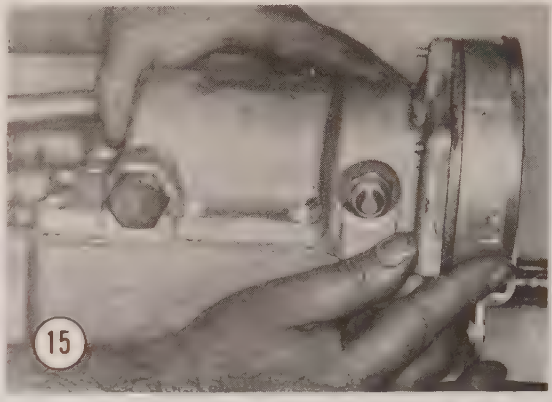

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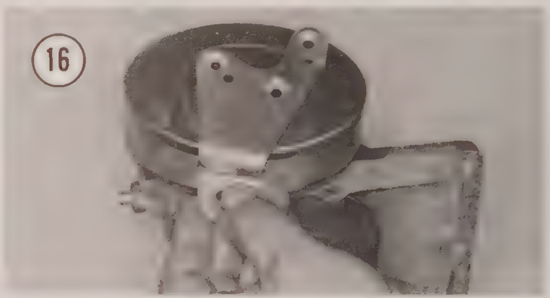

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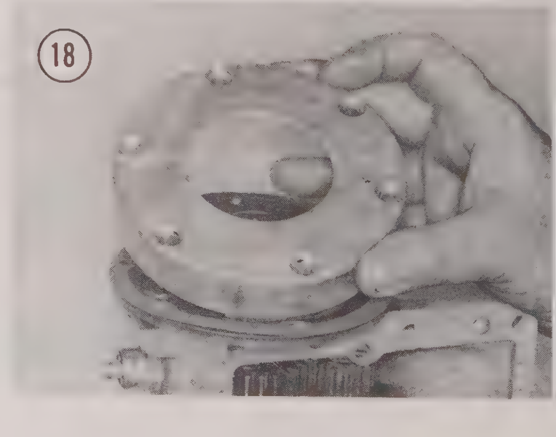
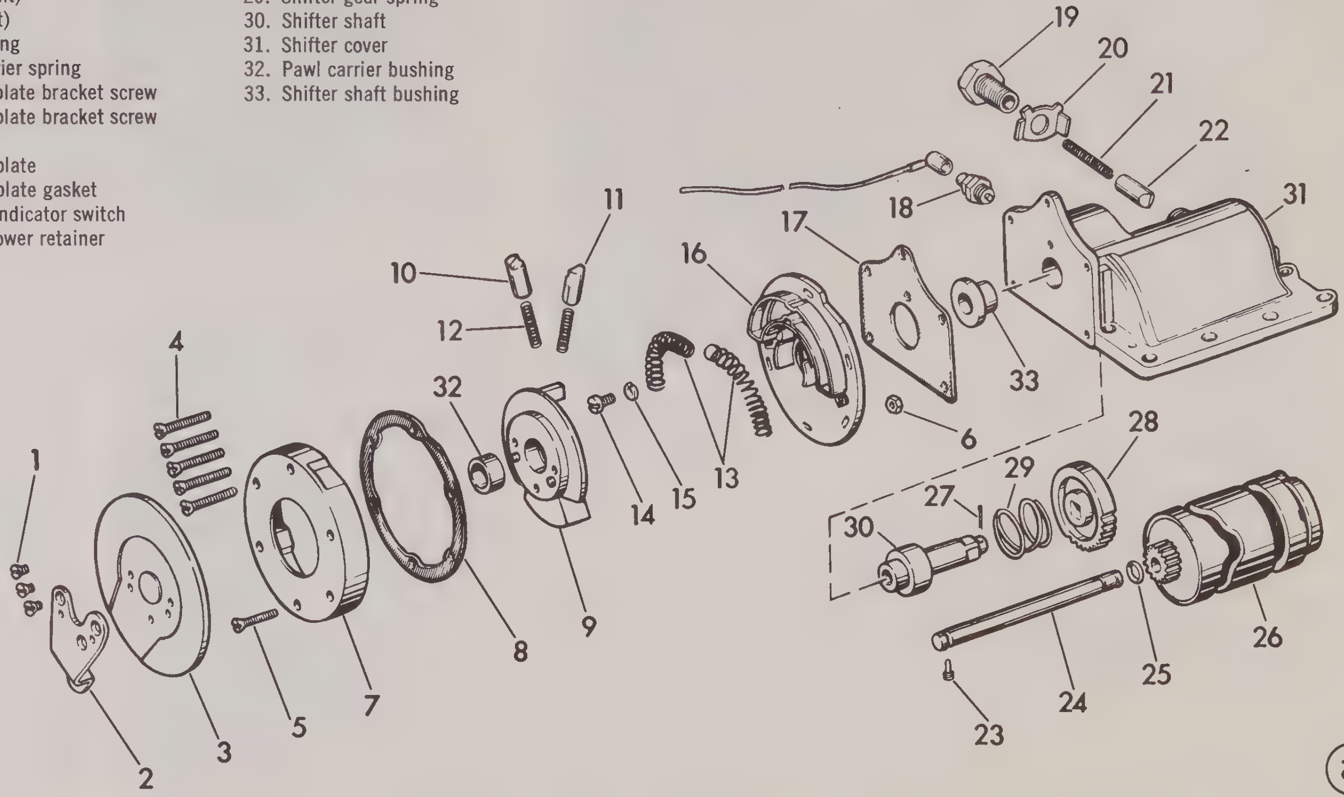


FOOT SHIFTER COVER

1. Shifter lever screw
2. Shifter lever
3. Dust shield
4. Shifter cover screw
5. Shifter cover screw (short)
6. Cover screw nut
7. Pawl carrier cover
8. Cover gasket
9. Pawl carrier
10. Pawl (right)
11. Pawl (left)
12. Pawl spring
13. Pawl carrier spring
14. Adapter plate bracket screw
15. Adapter plate bracket screw washer
16. Adapter plate
17. Adapter plate gasket
18. Neutral indicator switch
19. Cam follower retainer
20. Cam follower retainer washer
21. Spring
22. Cam follower
23. Camshaft lock screw
24. Camshaft
25. Oil seal
26. Shifter cam
27. Cotter pin
28. Shifter gear
29. Shifter gear spring
30. Shifter shaft
31. Shifter cover
32. Pawl carrier bushing
33. Shifter shaft bushing



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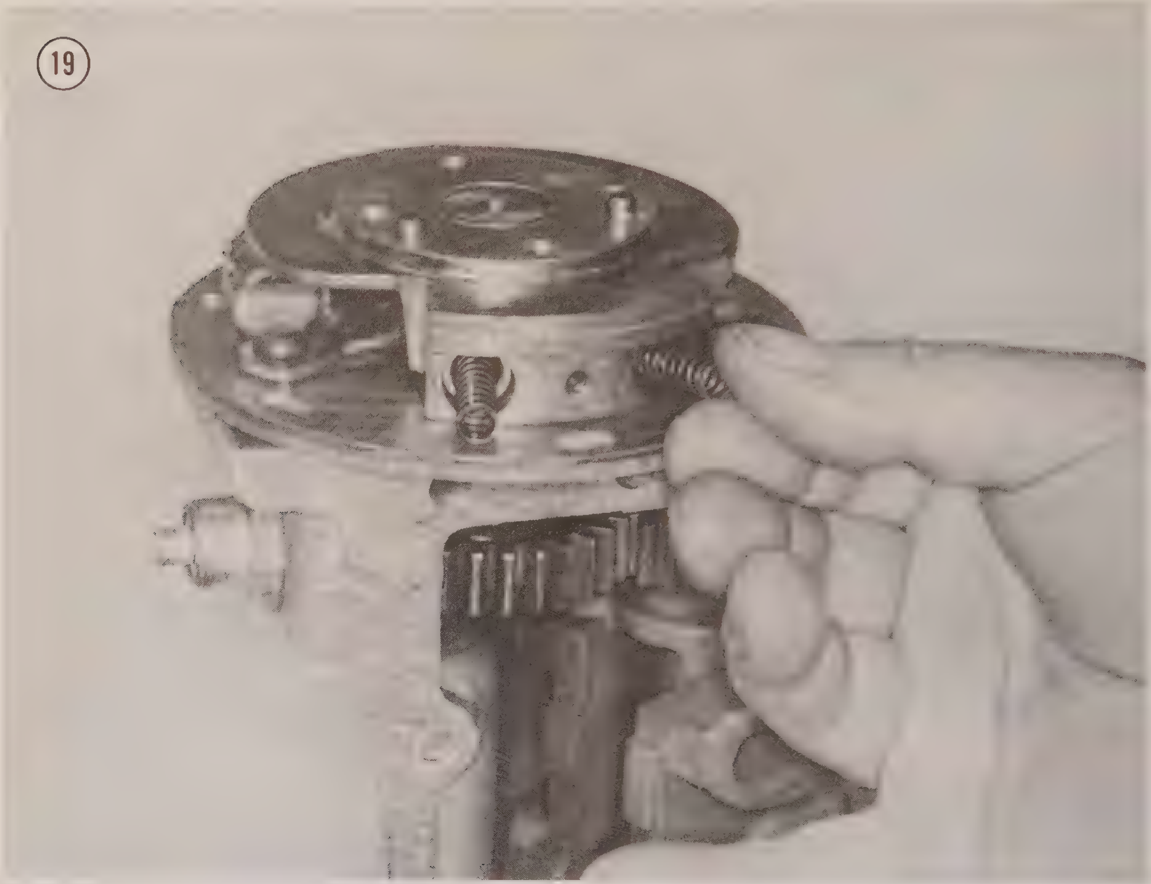

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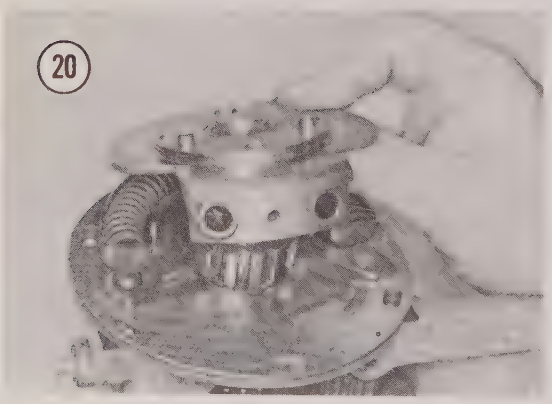

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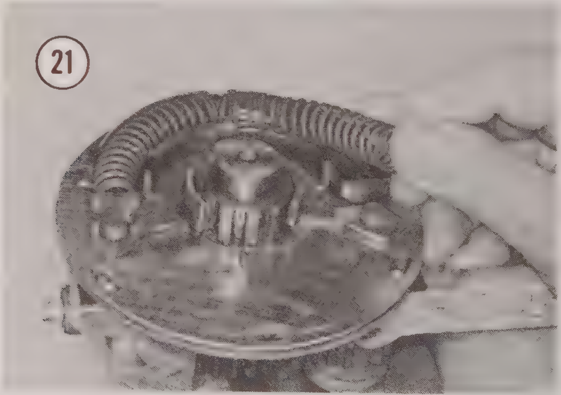


7. Remove adapter plate (16 in Figure 13) and pawl carrier springs (**Figure 21**).

8. Remove neutral switch (18 in Figure 13), cam follower (22 in Figure 13), and its attachment hardware.

9. Remove screw (23).

10. Remove shaft (24). A convenient method of doing so is to engage the head of a discarded valve into notch on end of shaft, then tap valve with a small hammer to pull out shaft.

11. Remove cam (26).

Clean all parts except neutral switch in solvent. Pay particular attention to the following procedures.

1. Be sure that shaft (30) is not loose in its bushings. Replace bushings if necessary. If pawl

carrier bushing (32) requires replacement, it may be removed by threading a ⅝ in. tap into it, removing the tap, then heating the cover to about 300°F. Quickly reinsert tap and clamp it in a vise. Strike cover with rawhide mallet to pull out bushing.

2. Be sure that teeth on shifter gear and cam are not worn.

3. Be sure that pawls operate smoothly in their bores (**Figure 22**). Also, be sure that pawl tips are not worn. They must be reasonably sharp if they are to function properly.

22

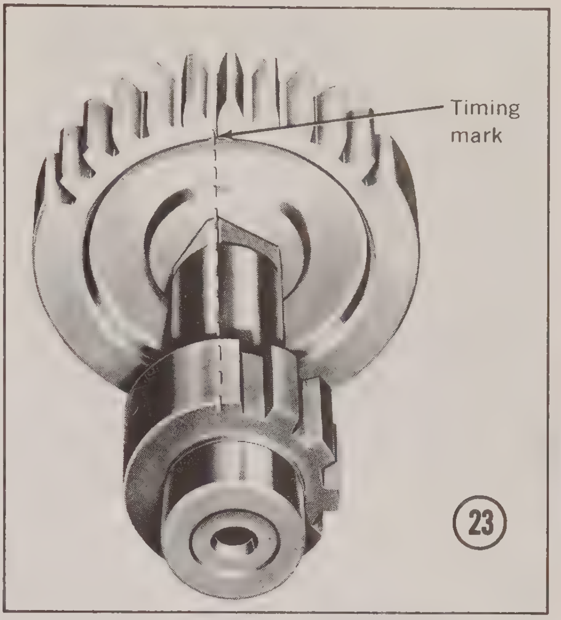
4. Be sure that springs are not cracked or worn.

When reassembling foot shifter, be sure to time shifter shaft (30) to shifter gear (28), and shifter gear (28) to shifter cam (26). There is a timing cut between the 2 center teeth on one side of the shifter gear. This mark must be aligned with the corner of the squared end of shifter shaft (30) which is just to the left of its last ratchet tooth (**Figure 23**).

Be sure to position shift gear (28) so that side of gear with timing mark is toward transmission case. Then install shaft (30) so that gear and shaft are timed as described in the foregoing paragraph.

Install shifter cam so that timing mark on top of tooth aligns with timing mark on shifter gear. Slip oil seal onto wider of 2 grooves on camshaft (24), then insert shaft into cover through shifter cam (26).

Install cam follower (22) and its retaining hardware.



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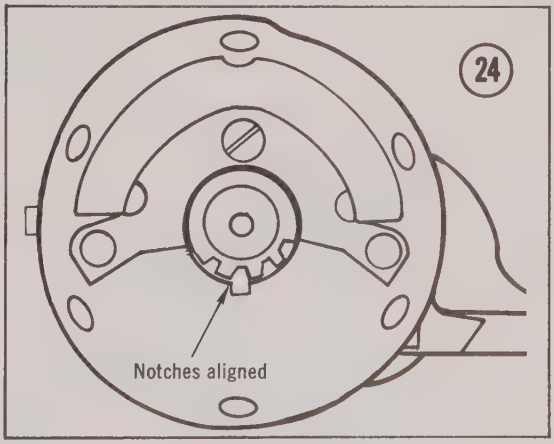
Clamp cover (31) in a vise with shifter mechanism upward. Install gasket (17) and adapter plate (16). Install screw (14) and washer (15), but do not tighten screw completely. Move cam to any gear position but neutral, then rock cam back and forth to be sure that cam follower (22) is fully seated. Turn adapter plate until timing notch (**Figure 24**) aligns exactly with notch between the 2 shifter gear teeth. Then tighten the screw (14).



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Grease springs (13) before installation. Also grease ratchet end of shifter shaft (30). Lubricate pawls (10 and 11) with light oil. When installing pawls, be sure that notches in ends of pawls face toward each other.

Lug on pawl carrier (9) should fit between ends of springs (13). Grease back side of pawl carrier before installation. Apply thread lock cement to screws (4 and 5), also to screws (1).

When replacing shifter cover, use thread cement on all screws except vent screw. Longer screws go into holes adjacent to bulge in cover.

Hand Shift Cover

Figure 25 is an exploded view of this cover. Refer to that illustration during disassembly and service.

1. Perform Steps 1 and 2 of foregoing *Foot Shift Cover*.
2. Remove screw (1).
3. Engage head of a discarded valve in groove of shaft (2), then tap valve to pull out shaft.
4. Remove cam (4).
5. Remove cotter pin (5).
6. Wedge screwdriver or chisel between gear (8) and case (13). Tap screwdriver or chisel to force gear from shaft or shifter lever (6).
7. Remove lever (6) and leather washer (7).
8. Remove screw (10), spring (11), and ball (12).

Clean all parts in solvent, except for leather washer (7) and oil seal (3), then inspect all parts carefully for wear or damage. Slightly worn parts may be reused with no impairment of function.

If bushing (14) is badly worn, it may be replaced by threading it with a ⅝ in. tap, then heating area around bushing to about 300°F. Replace tap and clamp it in a vise. Tap cover with a rawhide mallet to pull out bushing.

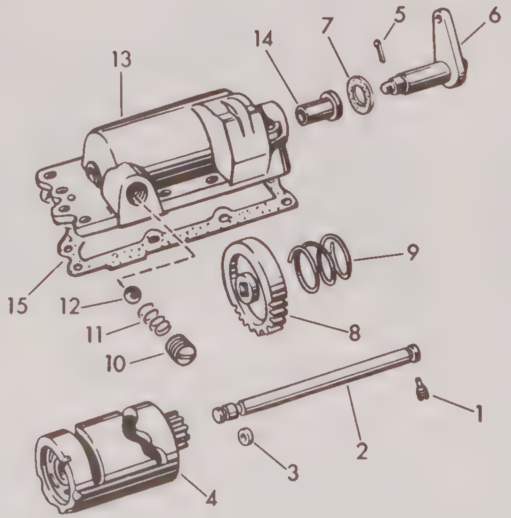
Pay particular attention to slots and plunger ball seats in cam (4). They must be unworn and have sharp edges. Replace cam if worn.

When reassembling cover, it is necessary to time shifter lever gear (8) to gear on cam (4). Install spring (9) and gear (8) with spring over gear hub and timing mark between gear teeth facing bushing (14) in cover. Install cam (4) so that notch in tooth on its gear aligns with timing mark on gear (8). Install lever and shaft (6) so that lever points toward front left screw hole in cover.

Install cam (4) in cover so that timing mark on it aligns with timing mark between teeth of shifter lever gear (8).

Be sure that oil seal is in wider groove of shaft (2).

(25)



HAND SHIFTER COVER

1. Shaft lock screw
2. Shaft
3. Oil seal
4. Shifter cam
5. Cotter pin
6. Shifter lever
7. Leather washer
8. Shifter gear
9. Shifter gear spring
10. Cam plunger cap screw
11. Ball spring
12. Plunger ball
13. Cover
14. Shifter lever bushing
15. Cover gasket

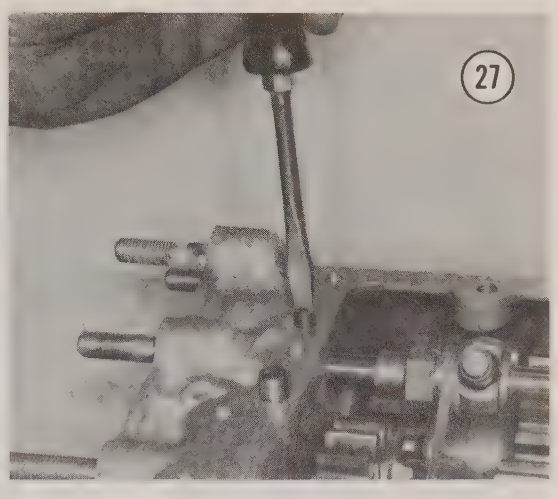
Shifter cam end-play should be 0.0005 to 0.0065 in. Add shim washer if necessary, or if end-play is insufficient, file down boss inside cover.

When replacing shifter cover, use thread cement on all screws except vent screw. Longer screws go into holes adjacent to bulge in cover.

Shifter Forks

Figure 26 is an exploded view of both shifter forks and related components. Refer to that illustration during disassembly and service.

1. Remove shifter cover.
2. Remove lockscrew (**Figure 27**).
3. Start shaft (2) with a suitable drift, then pull it from transmission case (**Figure 28**). Note that shifter forks are not interchangeable. **Figure 29** illustrates forks assembled correctly; fork on right side of that illustration goes toward transmission sprocket. Take care not to drop finger rollers (4) when disassembling forks.



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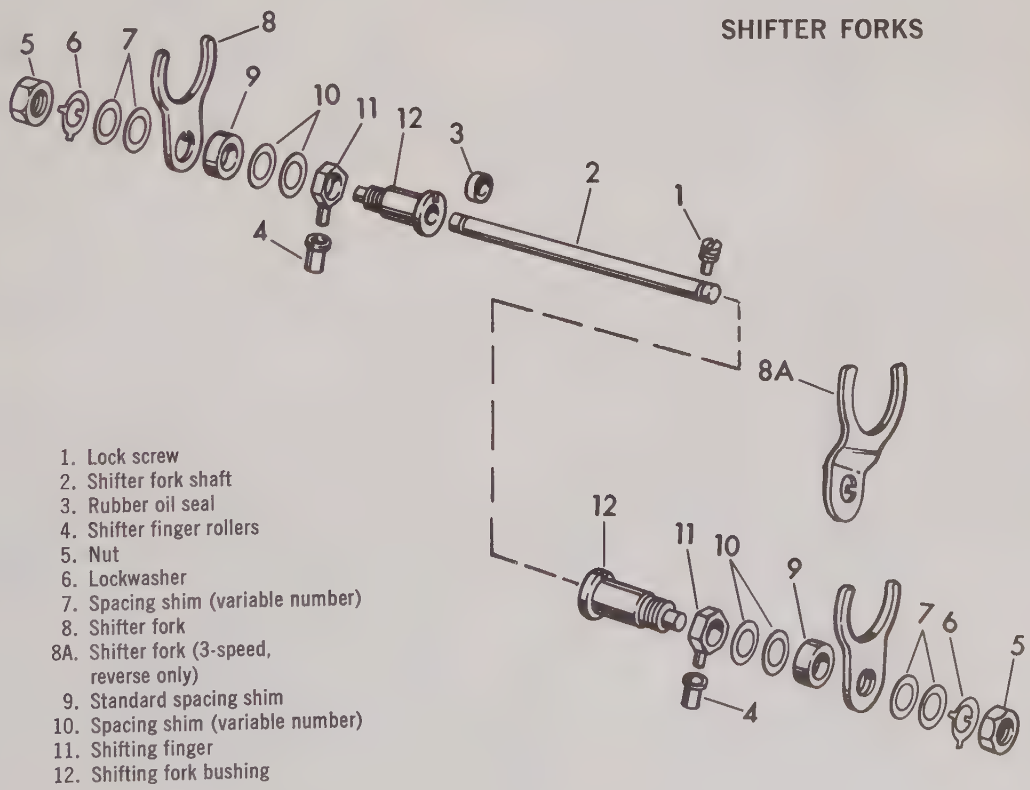


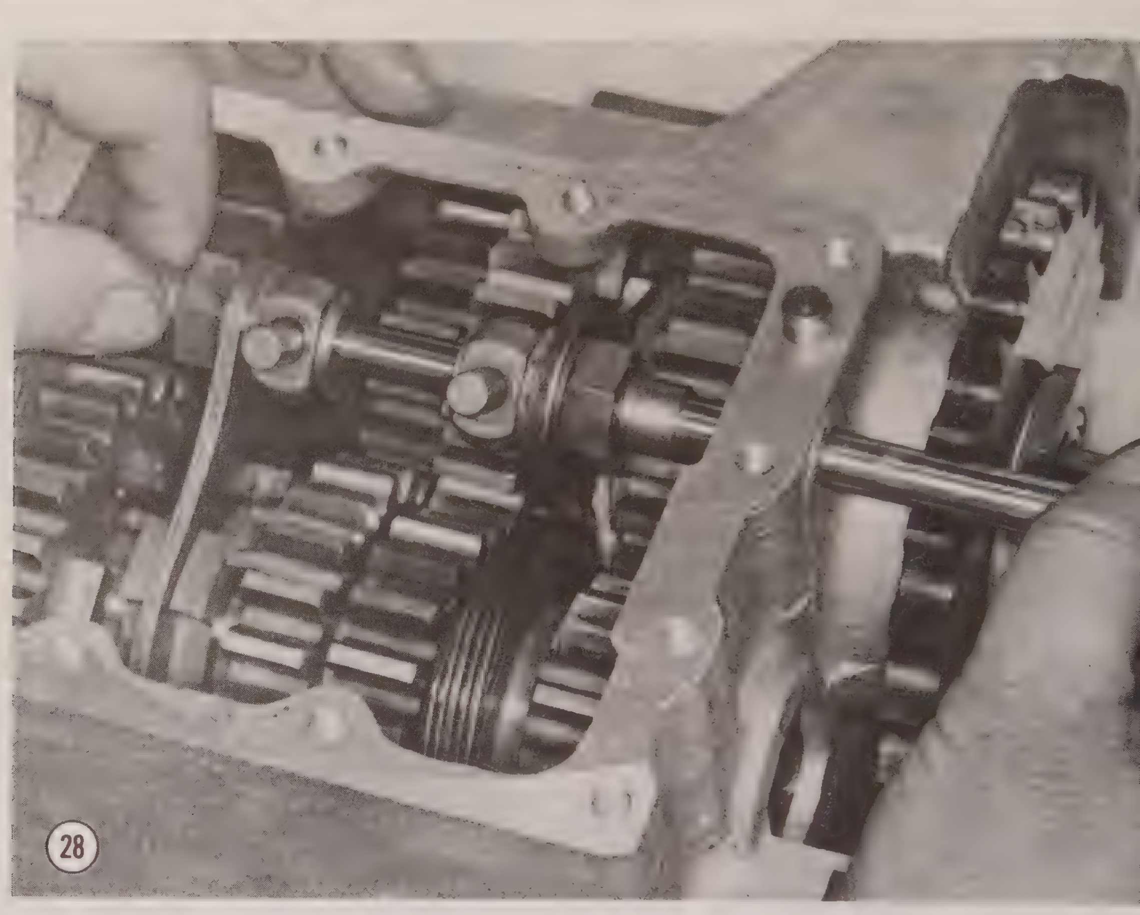
26

SHIFTER FORKS

1. Lock screw
2. Shifter fork shaft
3. Rubber oil seal
4. Shifter finger rollers
5. Nut
6. Lockwasher
7. Spacing shim (variable number)
8. Shifter fork

8A. Shifter fork (3-speed, reverse only)

9. Standard spacing shim
10. Spacing shim (variable number)
11. Shifting finger
12. Shifting fork bushing



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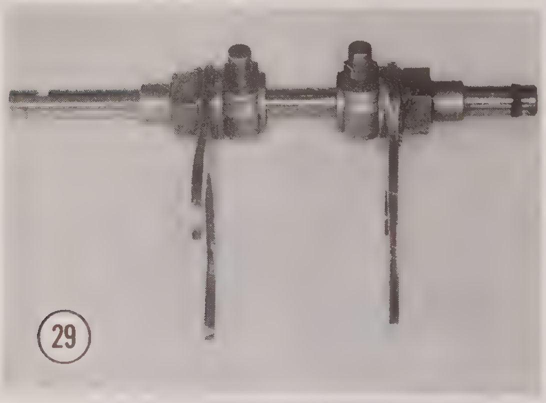

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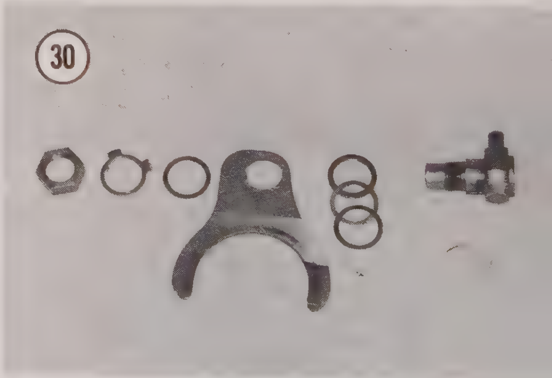
4. Do not disassemble forks unless replacement is necessary.

Clean all parts with solvent, then blow dry. Examine forks for wear or bending. Do not attempt to straighten bent forks. Be sure that bushings in forks slide freely on shaft, but that they are not loose. Replace bushings if they are worn.

Note that there are adjustment shims (**Figure 30**) which go on either or both sides of forks. These shims adjust shifter clutch clearance. Shims are available in 0.007 and 0.014 in. thicknesses.



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Tool 96384-39 is available for checking shifter clutch clearance. This job is best left t a Harley-Davidson shop.

Countershaft Removal

Figure 31 is an exploded view of a typical countershaft assembly. Refer to that illustration during disassembly and service.

1. Remove kickstarter and starter clutch as described elsewhere in this chapter.
2. Remove shifter cover and shifter forks.
3. On 1964 and earlier models, remove screws (1), washers (2), end cap (3), and gasket (4).
4. Remove nut (5) and washer (6), then pull out lock plate (**Figure 32**).
5. Drive countershaft (8) from case, using a suitable drift (**Figure 33**).
6. Lift countershaft gear assembly from transmission case (**Figure 34**). Note that washer (9) will drop into transmission case. Don't forget to retrieve it. Do not disassemble countershaft gear assembly unless repairs are required.

If disassembly is necessary, proceed as follows. Note carefully how each part is installed.

1. Remove low gear (10), bushing (11), washer (12), and shifter dog clutch (13).

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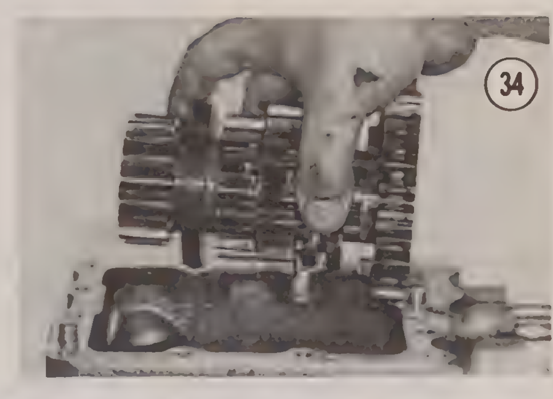

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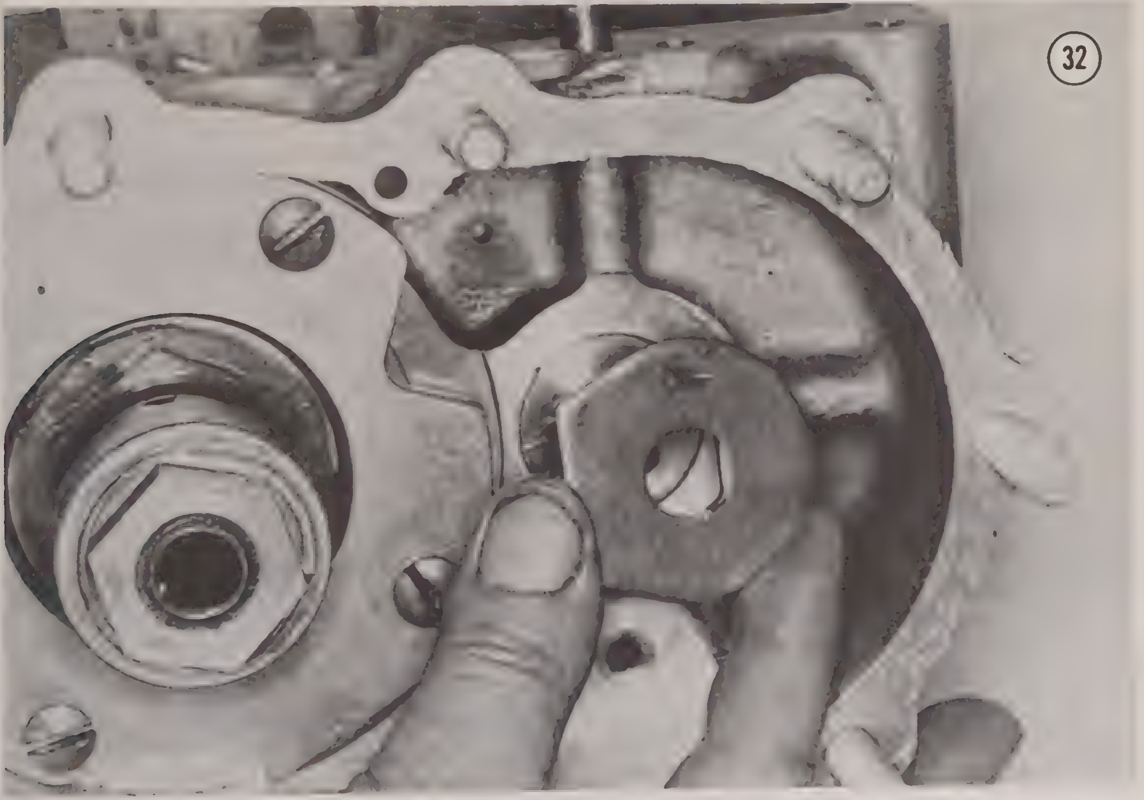

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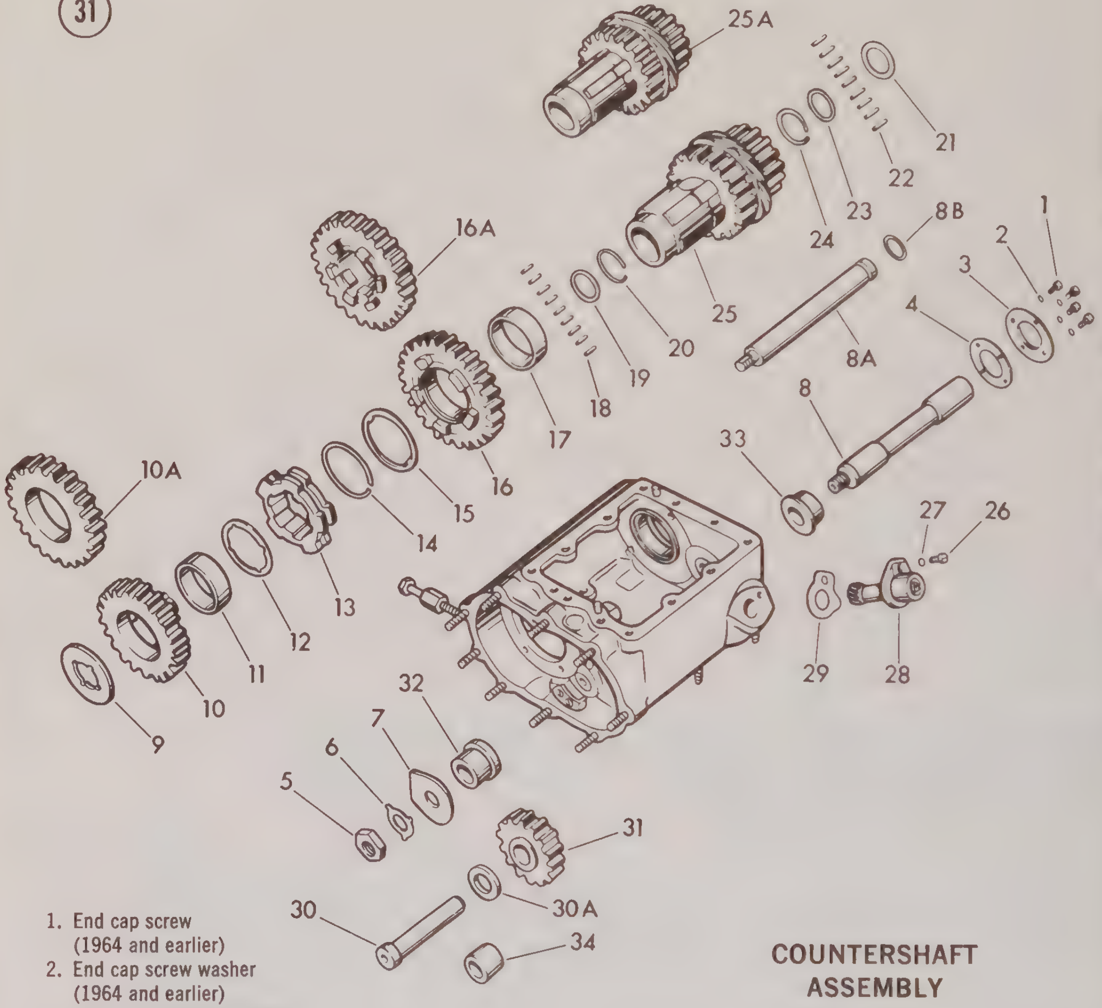


COUNTERSHAFT ASSEMBLY

1. End cap screw (1964 and earlier)
2. End cap screw washer (1964 and earlier)
3. End cap (1964 and earlier)
4. End cap gasket (1964 and earlier)
5. Countershaft nut
6. Lockwasher
7. Lock plate
8. Countershaft (1964 and earlier)
8A. Countershaft (1965)
8B. O-ring (1965)
9. Countershaft gear and washer
10. Low gear
10A. Countershaft reverse gear
11. Low gear bushing
12. Low gear bearing washer
13. Shifter clutch
14. Spring lock ring
15. Gear retaining washer
16. Countershaft second gear
16A. Countershaft low gear (3-speed and reverse)
17. Second gear bushing
18. Bearing rollers
19. Roller retainer washer
20. Lock ring
21. Roller thrust washer
22. Roller bearing
23. Retaining washer
24. Lock ring
25. Countershaft gear
25A. Countershaft gear (19-tooth for 3-speed and reverse)
26. Speedometer drive housing screw
27. Washer
28. Speedometer drive unit
29. Drive unit gasket
30. Idler gear shaft
30A. Spacer washer (1964)
31. Idler gear
32. Countershaft mounting collar (starter side)
33. Countershaft mounting collar (clutch side)
34. Idler gear bushing

2. Remove lock ring (14), washer (15), 2nd gear (16), and bushing (17).

3. Remove rollers (18) and roller retainer (19) from recess in shaft end of countershaft gear (25). Pry out lock ring (20).

4. Remove washer (21), rollers (22), washer (23) and lock ring from other end of countershaft gear (25).

CAUTION

Be sure to keep each set of rollers separate. If rollers are mixed up, or any roller is lost, both sets must be replaced.

5. Remove speedometer drive housing (28) and its associated hardware.

6. Remove collars (32 and 33) if necessary, by heating case to about 300°F, then pressing them out.

On 3-speed transmissions, remove shaft (30), washer (30A), and reverse idler gear (31). To pull shaft, screw a ¼-20 bolt into end of shaft, then pull on head of bolt. It may be necessary to heat transmission case first.

Countershaft Inspection

Clean all parts in solvent, then blow dry with compressed air. Inspect all parts for wear or damage. Observe the following notes.

1. Be sure that gears are not pitted, cracked, or chipped. Replace if in doubt.

2. Be sure that bushings are not worn. Replace as necessary.

3. Be sure that dog teeth on shifter clutches are not battered, rounded, or worn. Also check mating dog teeth on gears.

4. Check that bearings are not worn. **Table 2** lists desired countershaft specifications.

5. Rollers (18 and 22) are available in standard size, and oversizes of 0.0004 to 0.0008 in.

Countershaft Installation

It is necessary to check bearing clearance and countershaft end-play before final assembly.

1. Install rollers (18 and 22) into countershaft gear. Use heavy grease to hold them in place. Be sure that new lock rings (20 and 24) are in place, also retaining washers (19 and 23).

Table 2 COUNTERSHAFT SPECIFICATIONS

Item	Clearance (Inch)
Drive gear bearing	0.0005-0.002
Low gear bearing	0.0005-0.002
Gear end-play	0.008-0.012
Second gear	
End-play	0.002-0.003
Bushing-shaft	0-0.0015
Bushing-gear	0-0.0015
Low gear	
Bushing-shaft	0.0005-0.0025
Bushing-gear	0.0005-0.0025
Gear backlash	0.003-0.006

2. Install thrust washer (21) into its recess (**Figure 35**).

35

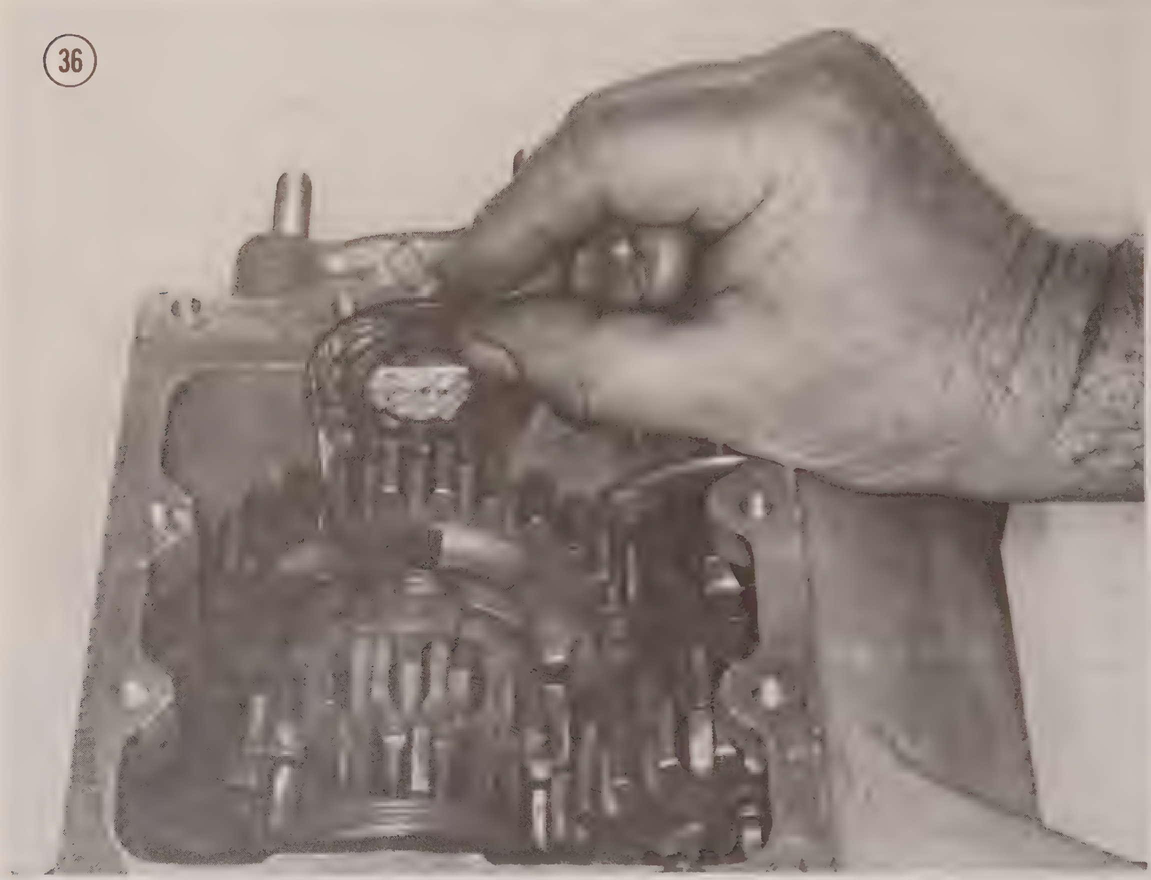
3. Temporarily slide assembly onto shaft (8 or 8A), then check bearing fit (refer to Table 1). Install new rollers (18 or 22) as required.

4. Install countershaft gear assembly and shaft into case, together with end-play adjusting washer (9).

5. Measure countershaft gear assembly end-play, which should be 0.008-0.012 in. If not within specifications, install another adjusting washer of appropriate thickness (**Figure 36**). Washers are available in various thicknesses:

0.074
0.078
0.082
0.085
0.090
0.095
0.010

36



The remainder of countershaft installation is the reverse of removal.

Main Shaft Removal

Figure 37 is an exploded view of a typical main shaft. Refer to that illustration during disassembly and service.

1. Remove kickstarter and starter clutch.
2. Remove shifter cover and shifter forks.
3. Remove countershaft assembly.
4. Remove screws (1), oil deflector (2), and retaining plate (**Figure 38**).
5. Using a rawhide mallet, drive main shaft assembly toward right side (**Figure 39**) of case until bearing (6) or bearing housing (7) is just free of case.
6. Pry lock ring (12) from its groove, then slide it onto main shaft splines (**Figure 40**).
7. Pull nut (4), washer (5), bearing (6), housing (7), gear (8), and shaft (9) out through case opening. At the same time, remove gear (10), washer (11), lock ring (12), and shifter clutch (13) out through top of case.
8. If bearing housing (7) does not come out with bearing, slide gear (8 or 8A) along shaft until its edge bears against bearing housing. Then drive out bearing housing together with main shaft. Be sure that gear does not overlap bearing housing, to avoid case damage.

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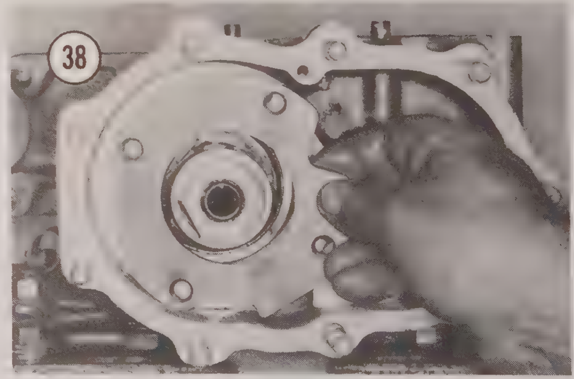

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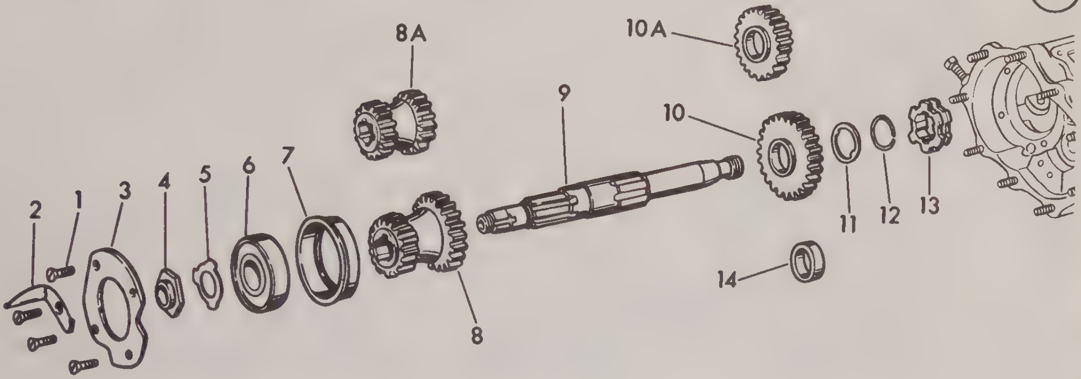


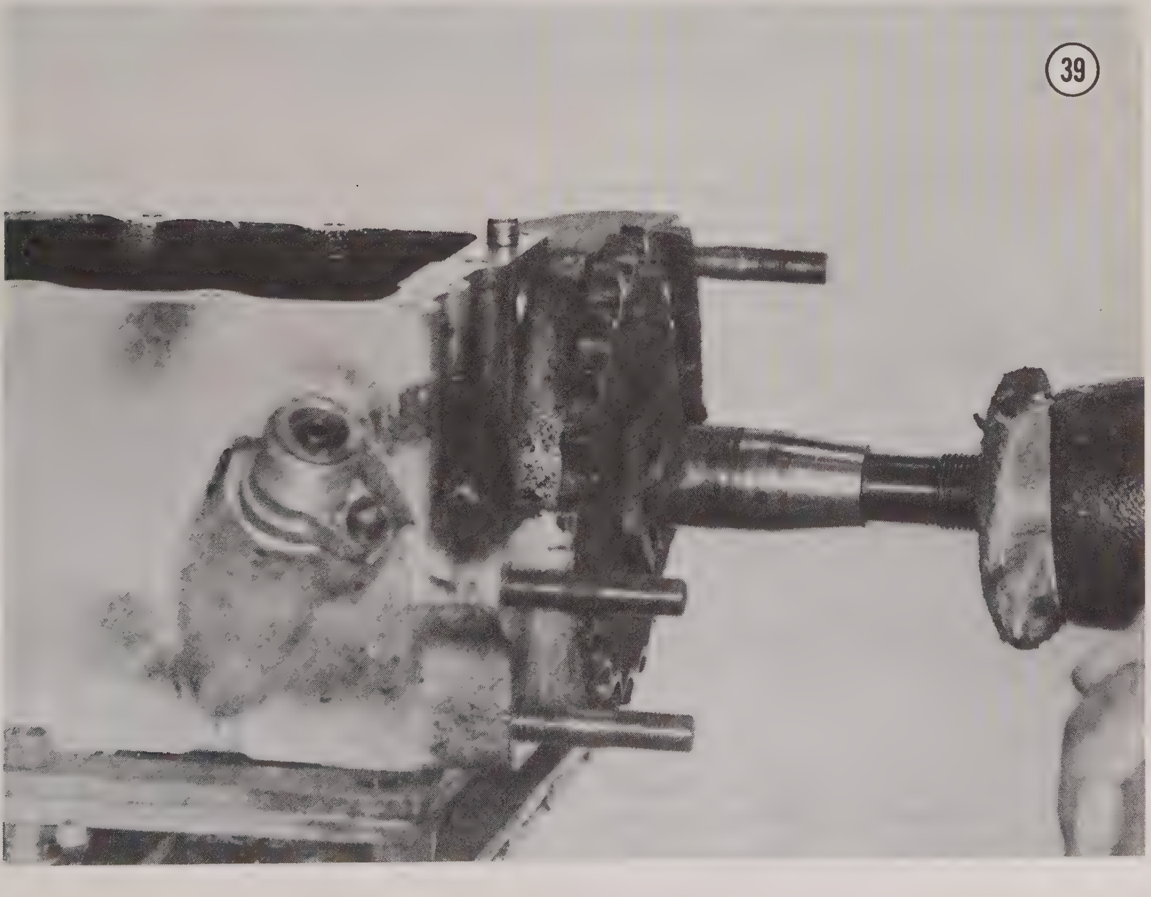
1. Bearing housing retaining plate screw
2. Oil deflector
3. Retaining plate
4. Ball bearing nut
5. Ball bearing washer
6. Main shaft bearing
7. Main shaft bearing housing
8. Low and second gear

8A. Low and reverse gear (handshift)

9. Main shaft
10. Third gear

10A. Main shaft second gear

11. Retaining washer
12. Lock ring
13. Shifter clutch
14. Third gear bushing (handshift)



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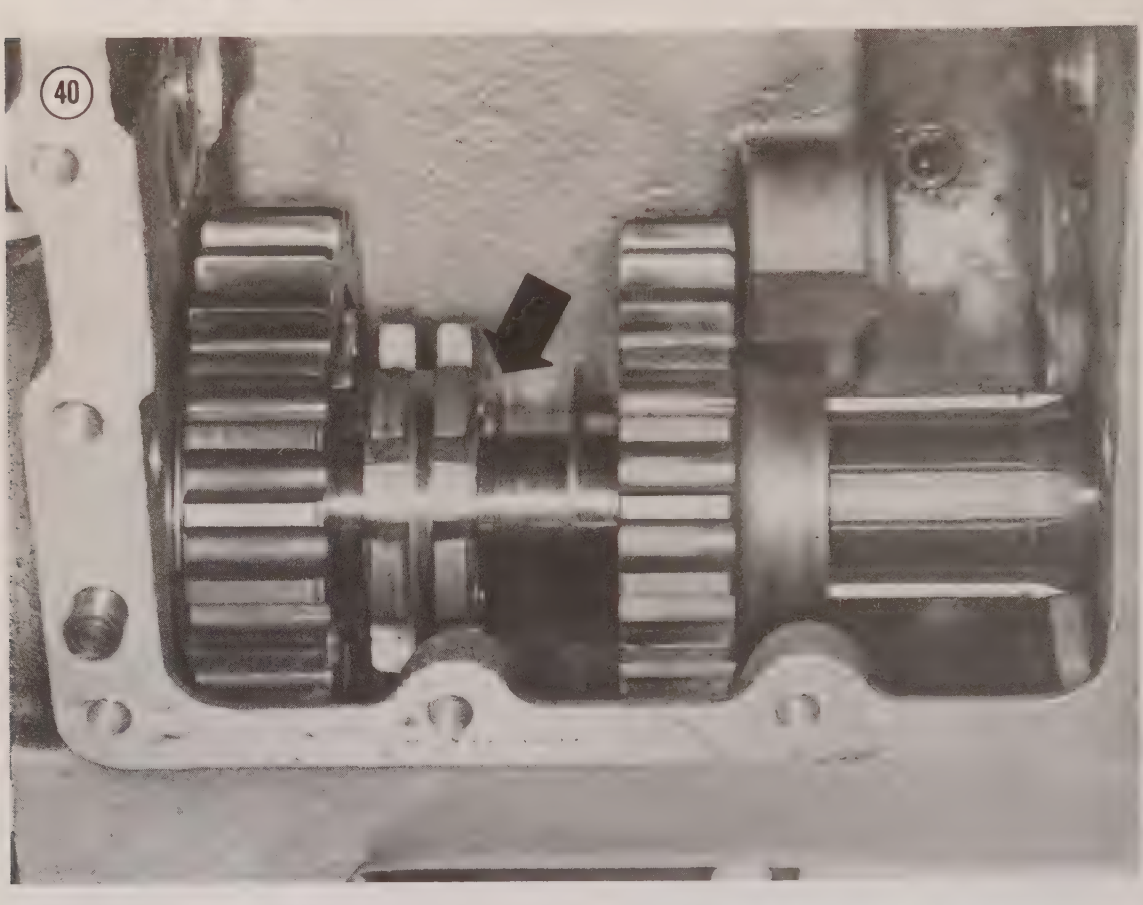


If further main shaft disassembly is required, clamp assembly between copper jaws in a vise. Then remove nut (4) and lockwasher (5). Remove the bearing (6) and the gear (8), using a suitable puller.

Main Shaft Inspection

Main shaft inspection is similar to countershaft inspection described earlier. Tolerances are listed in **Table 3**.

Main Shaft Installation

Main shaft installation is generally the reverse of removal. Observe the following notes.

1. Always install new lock rings. Be sure that they are fully seated in their grooves.
2. Be sure that HIGH mark on shifter clutch faces main drive gear.
3. Tap main shaft assembly into case with a brass or lead mallet until flange on bearing shoulders against case.

Table 3 MAIN SHAFT TOLERANCES

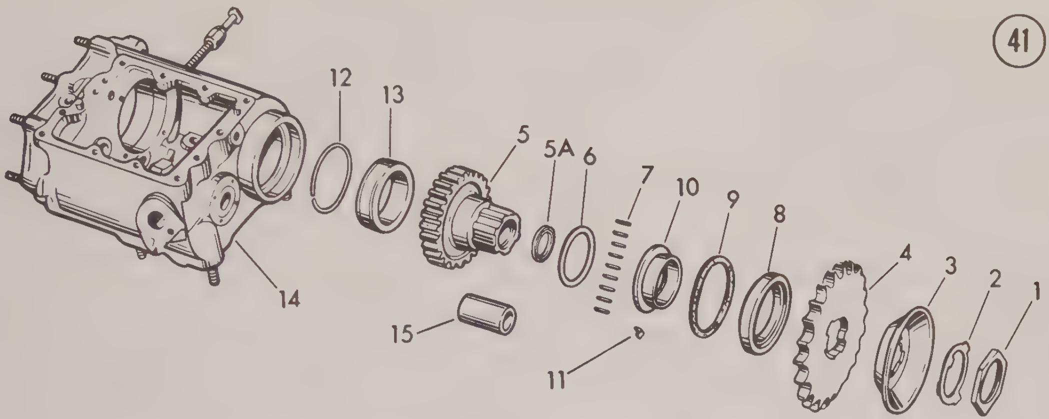
Item	Tolerance (Inch)
Low gear end bearing	Snug fit
In housing	Light press fit
Housing in case	Light press fit
Third gear	
End-play	0-0.017
Bushing-to-shaft	0.001-0.002
Bushing in gear	Press fit

4. On 3-speed transmissions, install reverse idler gear and the shaft before installing the retaining plate.

Main Drive Gear Removal

Figure 41 is an exploded view of a typical main drive gear assembly. Refer to that illustration during disassembly and service.

(41)



MAIN DRIVE GEAR ASSEMBLY

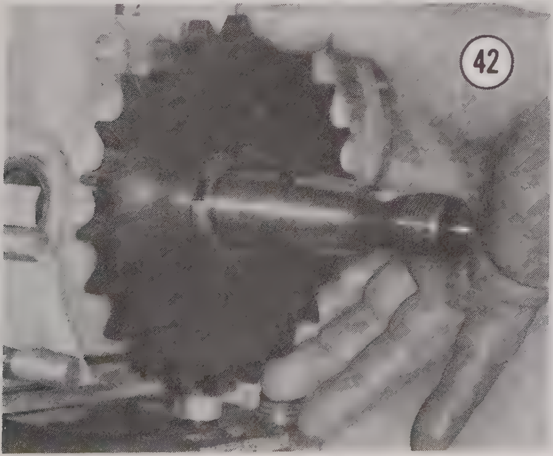
1. Sprocket locknut
2. Sprocket lockwasher
3. Oil deflector
4. Chain sprocket
5. Main drive gear

5A. Main drive gear shaft seal (1965)
6. Thrust washer
7. Roller bearings
8. Main drive gear oil seal
9. Oil seal cork washer

10. Main drive gear spacer
11. Main drive gear spacer key
12. Bearing race retaining ring
13. Bearing race
14. Gearbox
15. Main drive gear bushing

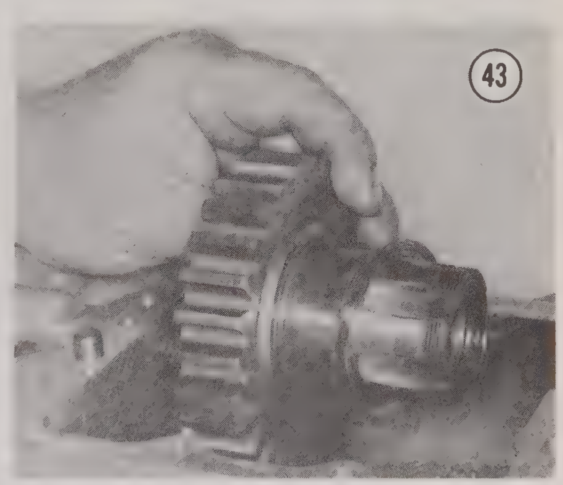
1. Remove kickstarter and starter clutch.
2. Remove shift forks.
3. Remove countershaft.
4. Remove main shaft.
5. Hold sprocket to prevent it from turning, then remove sprocket locknut, lockwasher, and sprocket (**Figure 42**). Note that this nut has a left-hand thread. Note that there is an oil deflector (3) on some models.

(42)



6. Push main drive gear (5) into case, then remove it through shifter cover opening (**Figure 43**). Thrust washer (6) usually comes out with this gear; if not, remove it also.

(43)



7. Remove rollers (7) from their bore. Be sure that all 44 of them are accounted for. If any are lost, or mixed up with another set, both sets must be replaced.

8. Do not remove oil seal (8), seal (5A), or spacer (10) unless they shows signs of wear or damage.

Main Drive Gear Inspection

Main drive gear inspection is similar to that of countershaft and main shaft gears. **Table 4** lists main drive gear inspection tolerances.

Table 4 MAIN DRIVE GEAR TOLERANCES

Item	Tolerance (Inch)
Roller bearing	0.0005-0.002
Inner bearing	0.002-0.003
End-play	0.003-0.013

Main Drive Gear Installation

Installation is generally the reverse of removal. Observe the following notes.

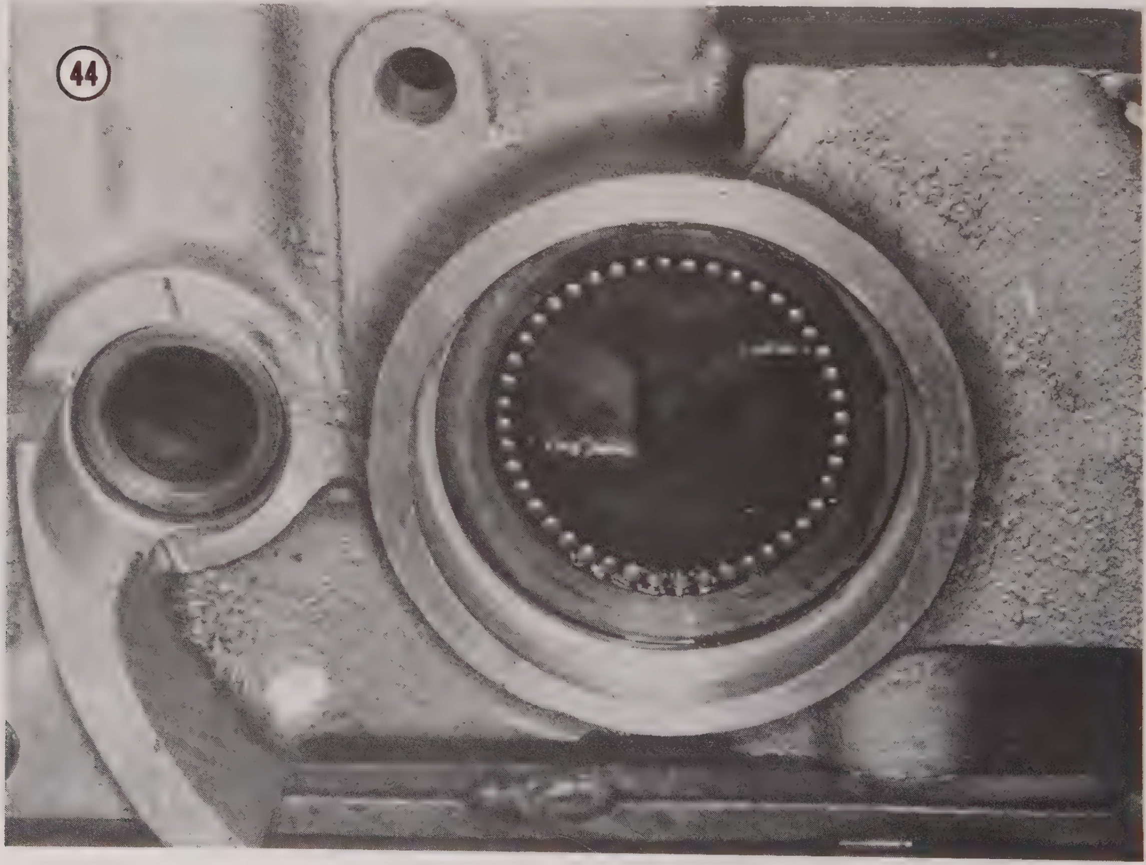
1. Hold rollers in position with heavy grease (**Figure 44**). Be sure that they do not fall out of position as main drive gear is installed.
2. Be sure that main drive gear spacer key (11) is installed properly. Longer side of key goes into any splineway on main drive gear, and shorter side goes into slot in outer side of spacer (10). This key is illustrated in **Figure 45**.

Main Drive Gear Oil Seal

This oil seal may be replaced with transmission installed. Tool 95660-42 is available to remove and replace this seal.

Before installing new seal, first scrape any burrs from seal counterbore in transmission case. Always install a new cork washer (**Figure 46**) behind new seal. Start new seal (**Figure 47**) into its counterbore after coating its lip with oil. Stake seal in position after pressing it in counterbore.

(44)



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NOTE: If you own a 1976 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER FIVE

CARBURETORS

This chapter discusses service and troubleshooting on the various carburetors installed on Harley-Davidson motorcycles.

KEIHIN CARBURETOR

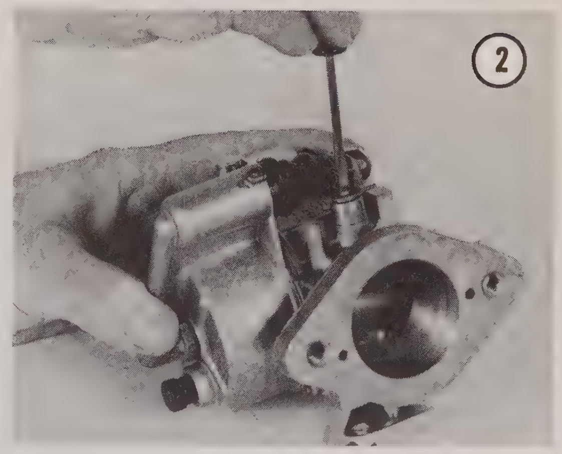
Refer to the supplement at the end of this book for service on this carburetor.

MODEL 16P12 CARBURETOR

Model 16P12 carburetors are installed on 1971 and later models. They incorporate floats, accelerator pumps, and idle mixture and speed controls. **Figure 1** is an exploded view of this carburetor. Refer to that illustration during disassembly and service.

Disassembly

1. Remove pump lever screw (**Figure 2**).
2. Remove accelerator pump as an assembly (**Figure 3**).
3. Remove idle tube and its gasket (**Figure 4**).
4. Remove jet and tube assembly (**Figure 5**). It may be necessary to give this assembly a firm tug to pull it from its bore. After pulling it out, remove its fiber washer and O-ring.



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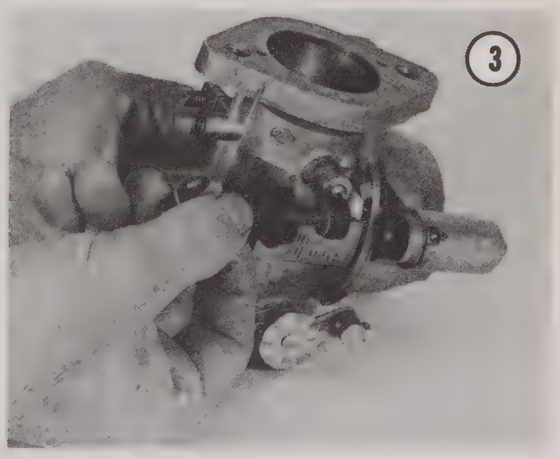

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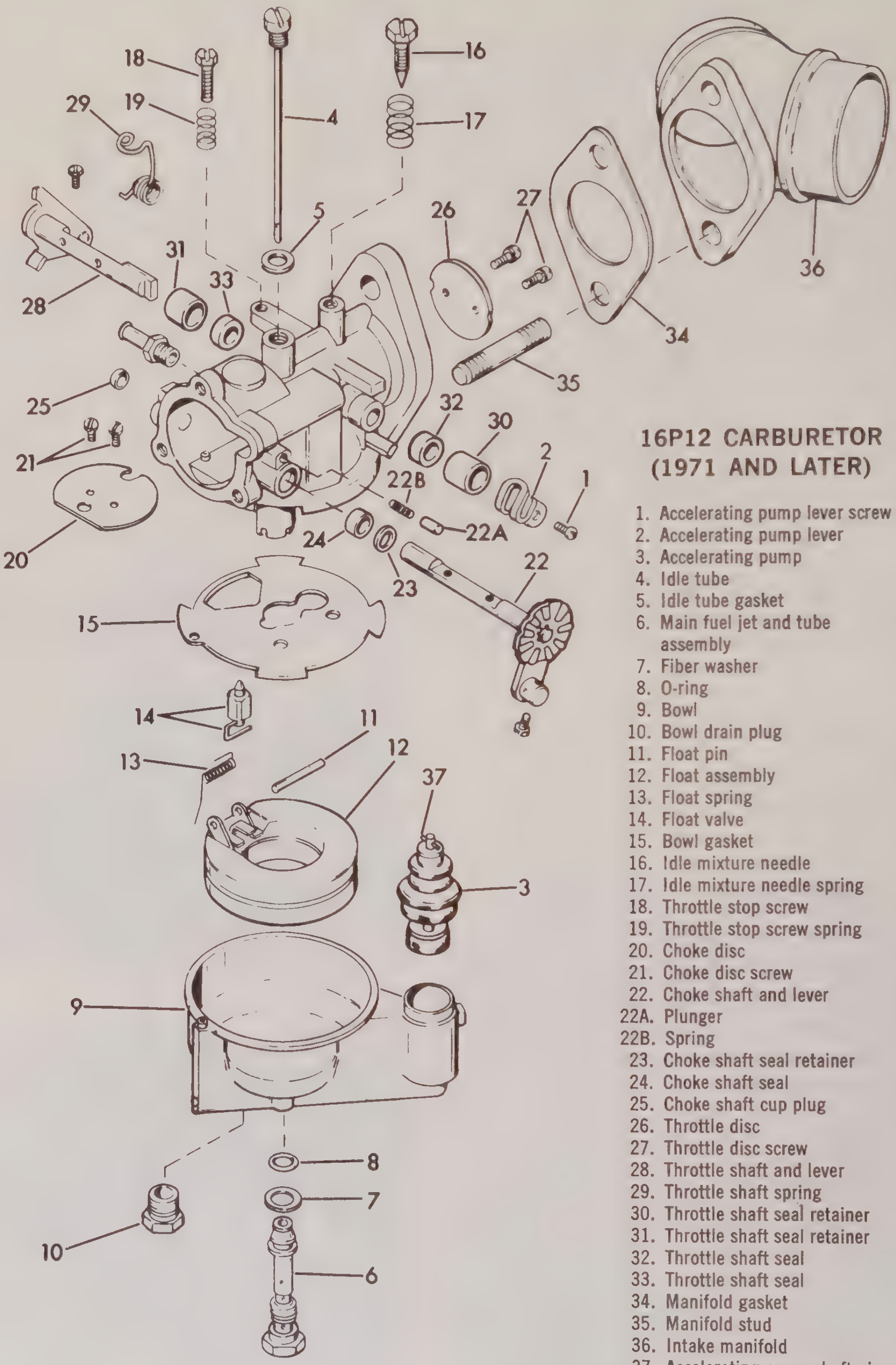


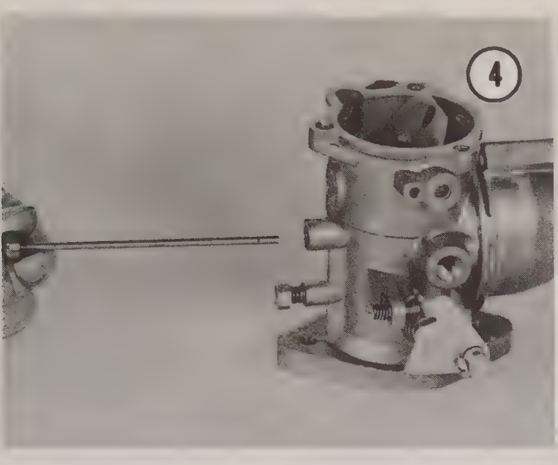
16P12 CARBURETOR (1971 AND LATER)

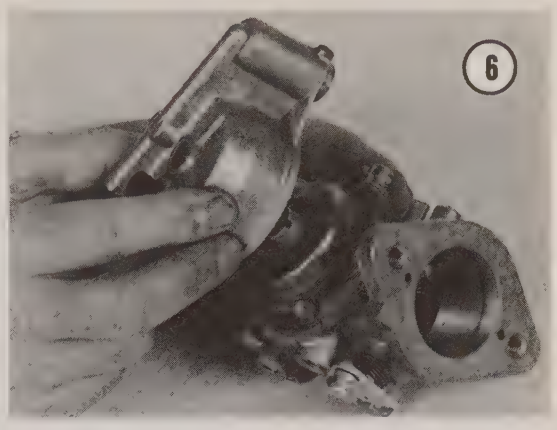
1. Accelerating pump lever screw
2. Accelerating pump lever
3. Accelerating pump
4. Idle tube
5. Idle tube gasket
6. Main fuel jet and tube assembly
7. Fiber washer
8. O-ring
9. Bowl
10. Bowl drain plug
11. Float pin
12. Float assembly
13. Float spring
14. Float valve
15. Bowl gasket
16. Idle mixture needle
17. Idle mixture needle spring
18. Throttle stop screw
19. Throttle stop screw spring
20. Choke disc
21. Choke disc screw
22. Choke shaft and lever

22A. Plunger

22B. Spring

23. Choke shaft seal retainer
24. Choke shaft seal
25. Choke shaft cup plug
26. Throttle disc
27. Throttle disc screw
28. Throttle shaft and lever
29. Throttle shaft spring
30. Throttle shaft seal retainer
31. Throttle shaft seal retainer
32. Throttle shaft seal
33. Throttle shaft seal
34. Manifold gasket
35. Manifold stud
36. Intake manifold
37. Accelerating pump shaft pin

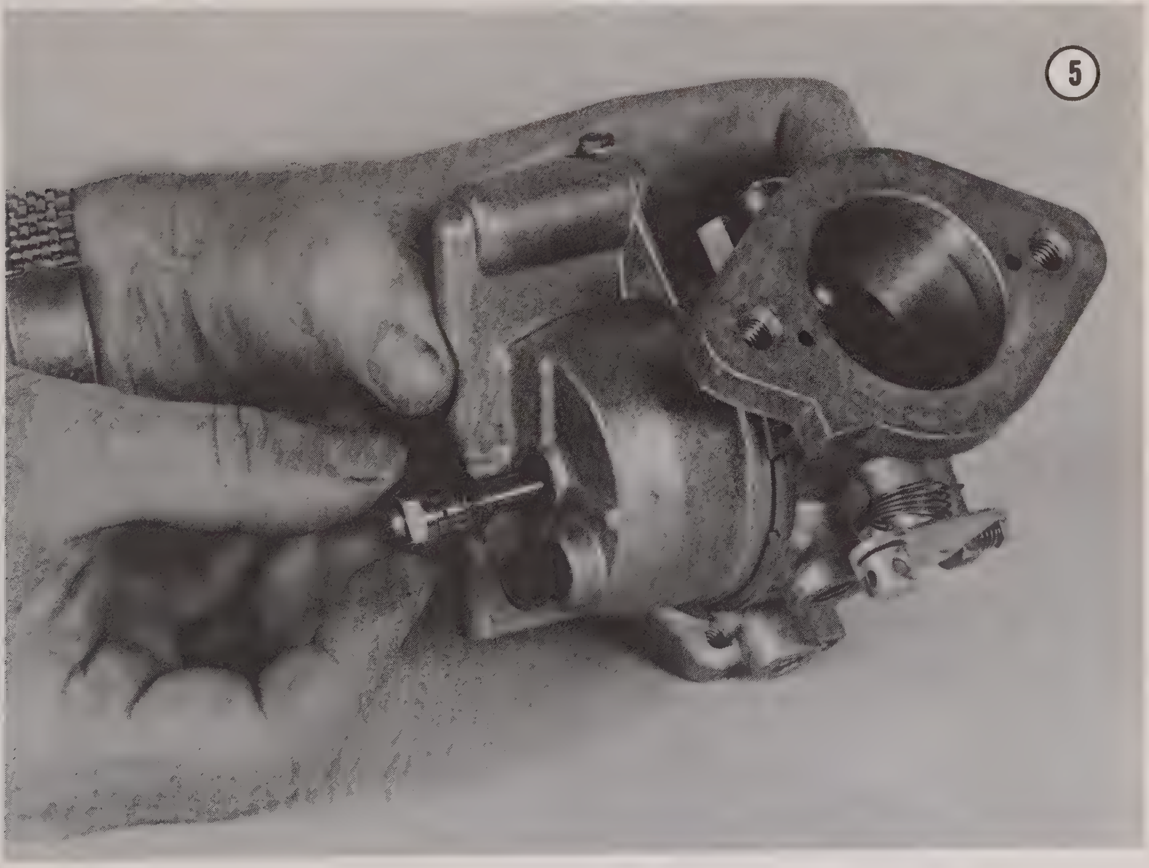




5. Remove float bowl (**Figure 6**).
6. Carefully remove float pivot pin (**Figure 7**).
7. Remove float, float needle, float needle clip, and float spring as an assembly (**Figure 8**).
8. Remove float bowl gasket (**Figure 9**).
9. Remove idle mixture screw (**Figure 10**).
10. Remove idle speed screw (**Figure 11**).

Inspection

Clean all metal parts in carburetor cleaning solvent. Do not use any wire or metal tools to clean jets or passages; doing so may change their calibration. Replace any parts that are damaged or worn. Be sure that the idle mixture needle tip is not worn or scored, also check the float needle and its seat carefully.



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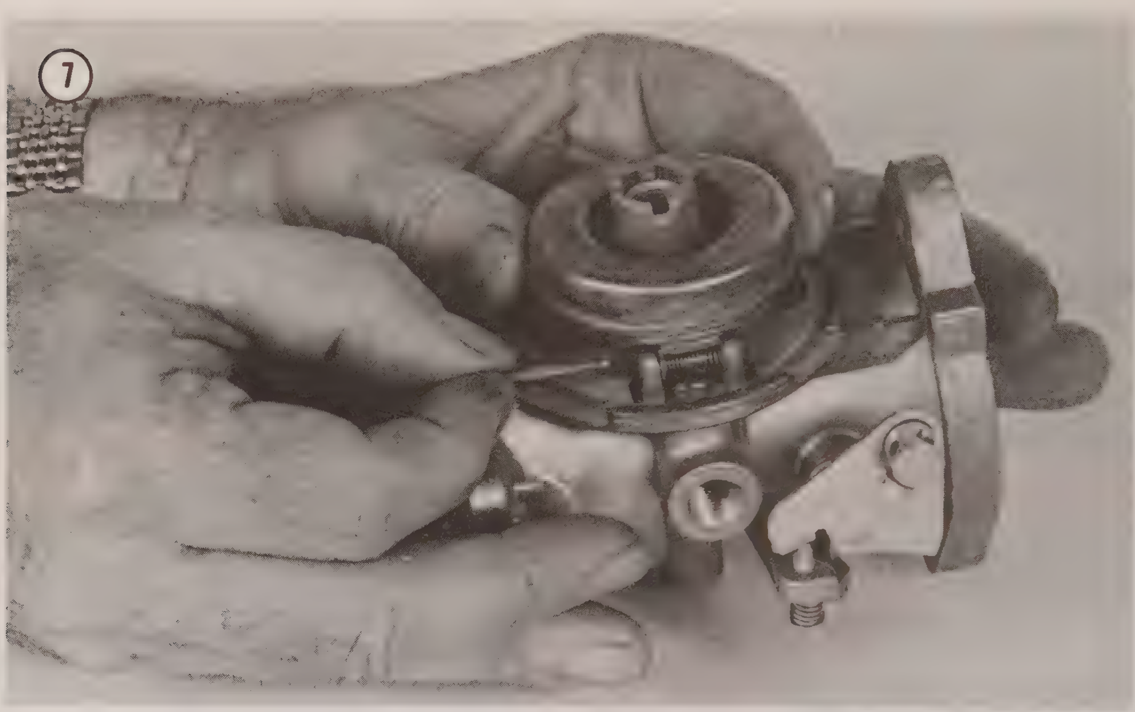

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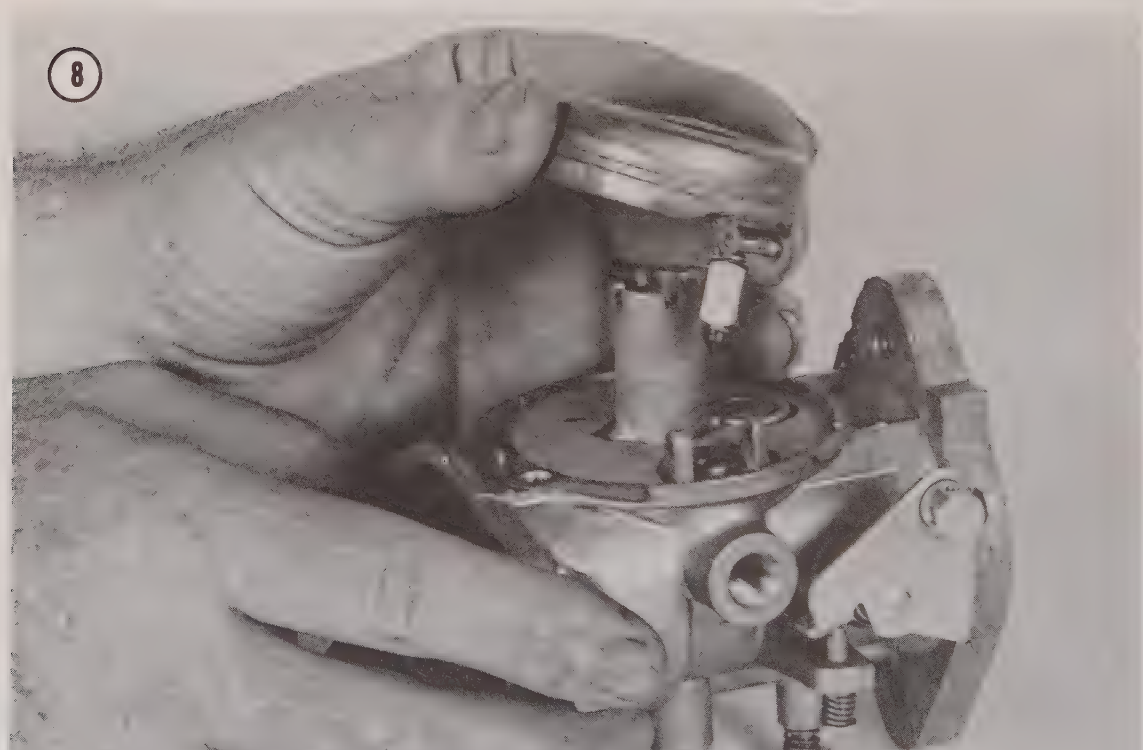

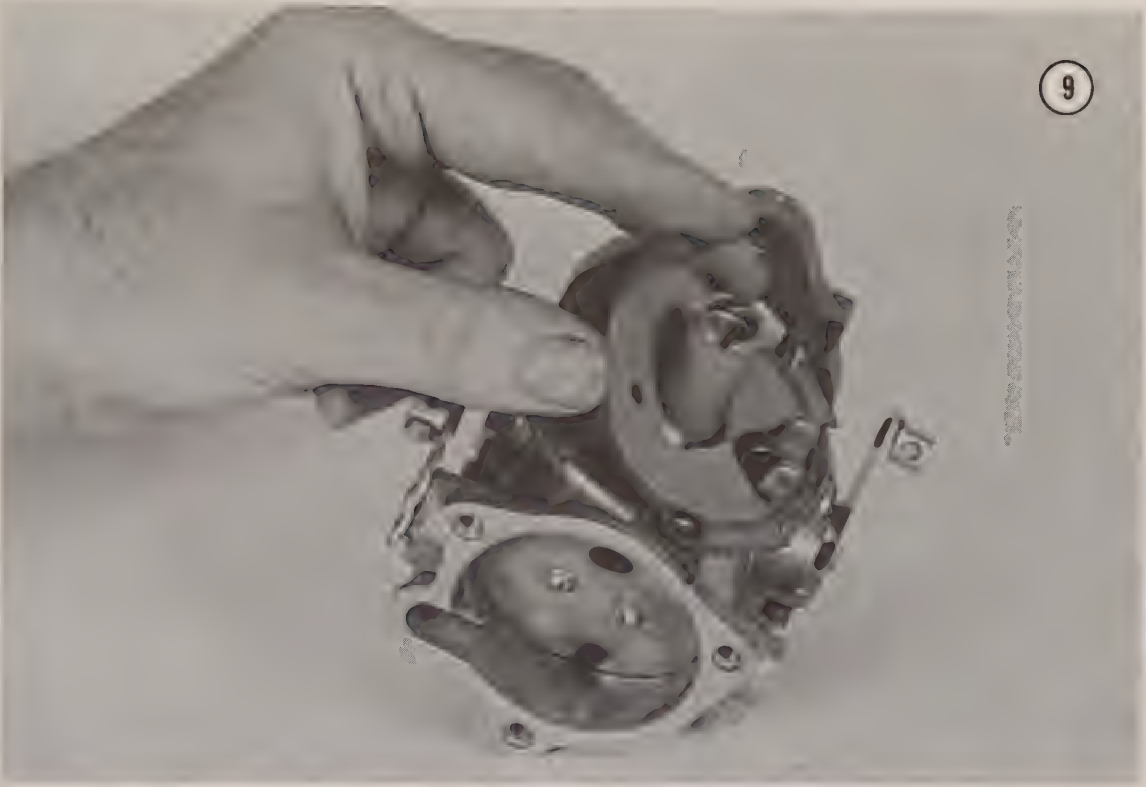
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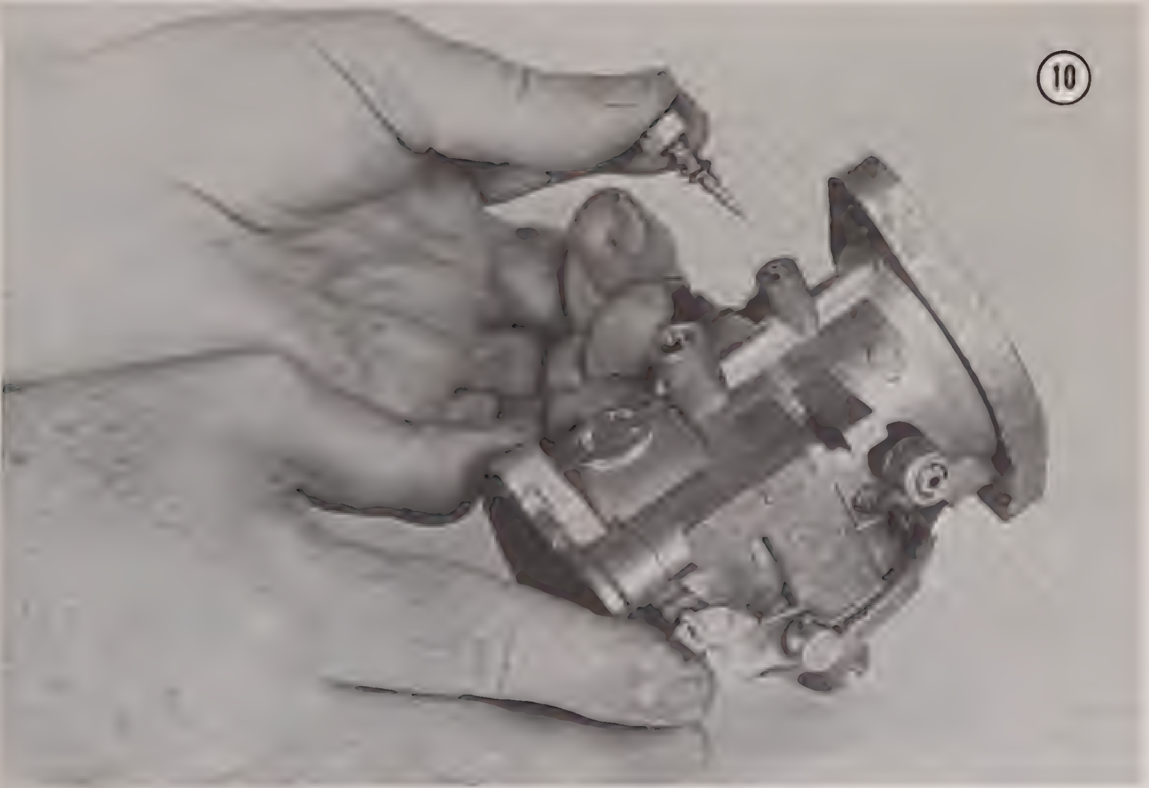
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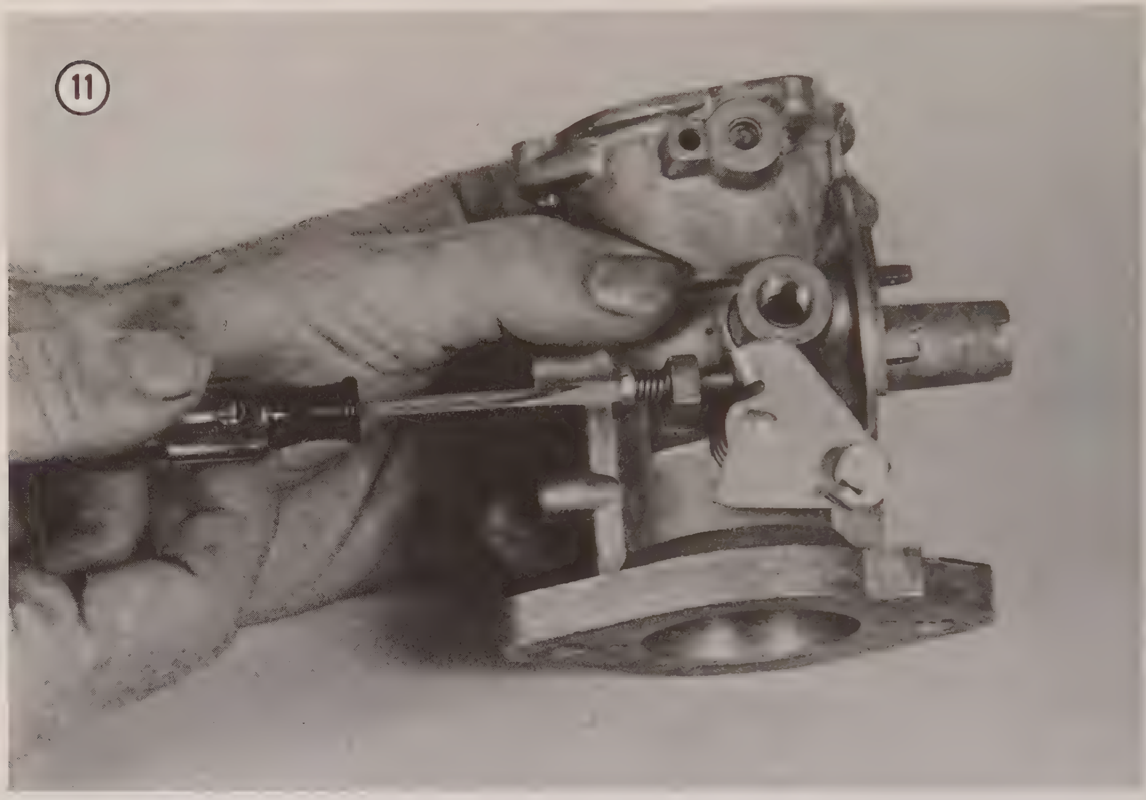

Reassembly

Reverse the disassembly procedure to assemble the carburetor. Pay particular attention to the following notes.

1. Be sure that float needle clip is attached to float tang.
2. Upon assembly, be sure that float spring is installed as shown in **Figure 12**. When installing float bowl, bend end of spring up so that it rests against inside of float bowl.
3. Be sure to check and adjust float level, if necessary, before installing float bowl.

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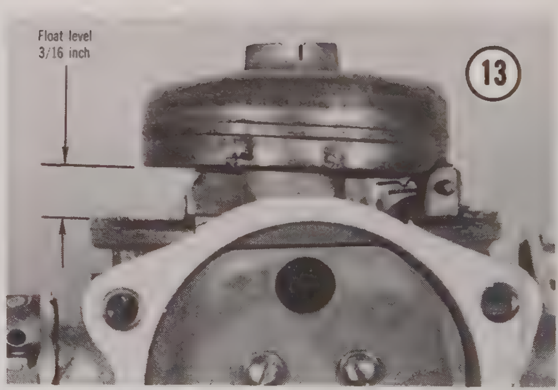

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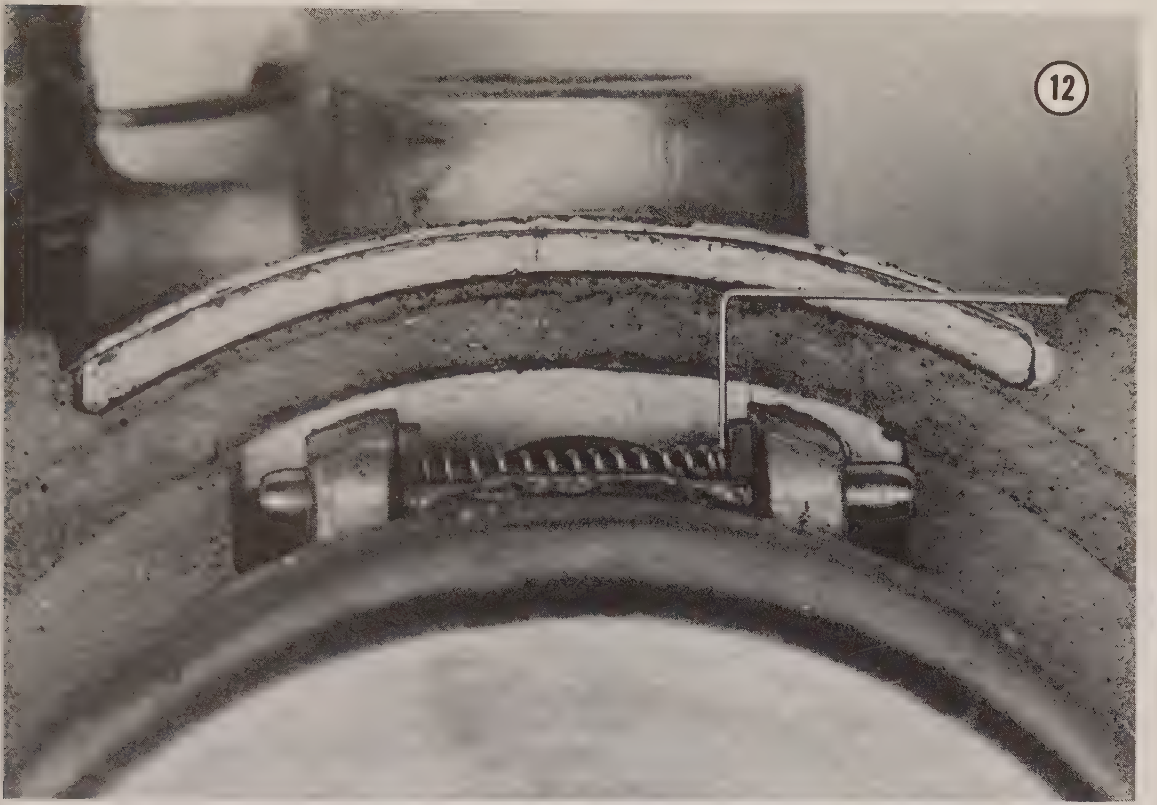
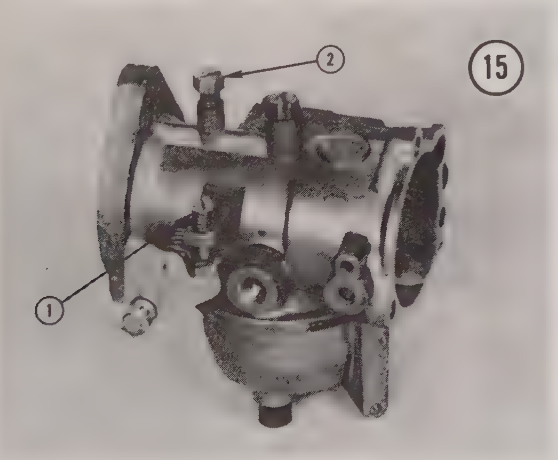
Adjustment

Float level must be checked and adjusted each time carburetor is disassembled. To do so, refer to **Figure 13**. With carburetor inverted, bottom surface of float must be 3/16 in. from carburetor gasket surface. A 3/16 in. drill may be used as a gauge. If adjustment is required, bend float tang (**Figure 14**) as required, using long nose pliers.



Remaining adjustments are performed with the carburetor installed on the motorcycle. Refer to **Figure 15**, then proceed as follows.



1. Idle speed screw
2. Low speed needle

1. Turn low speed needle fully clockwise until it seats lightly, then back it out 1½ turns.

2. Start engine and warm it thoroughly.

3. Adjust idle speed screw so that engine runs at 700-800 rpm with throttle fully closed.

CAUTION

Never adjust engine idle to slowest possible speed. Very slow idle speed results in bearing wear, oil consumption, and poor acceleration from idle.

4. Adjust low speed needle to make engine accelerate and run smoothly at idle.

5. Make final adjustment of idle speed screw, if required, to obtain 700-800 rpm idle.

MODEL HD CARBURETOR

Model HD carburetors were used from 1967 to 1970. These are dual-venturi tube, diaphragm type carburetors with automatic economizers and accelerator pumps. **Figure 16** is an exploded view of this carburetor. Refer to that illustration during disassembly and service.

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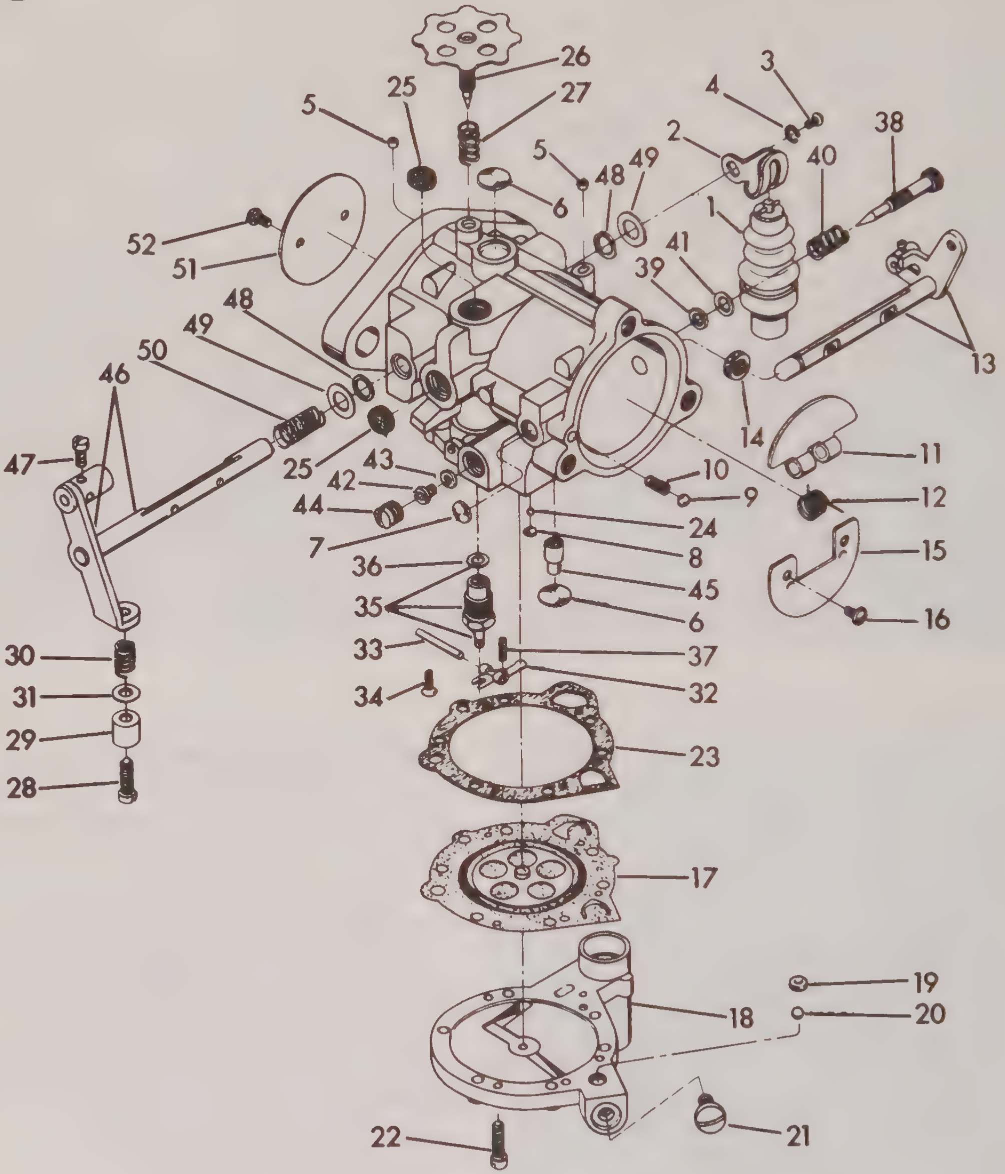
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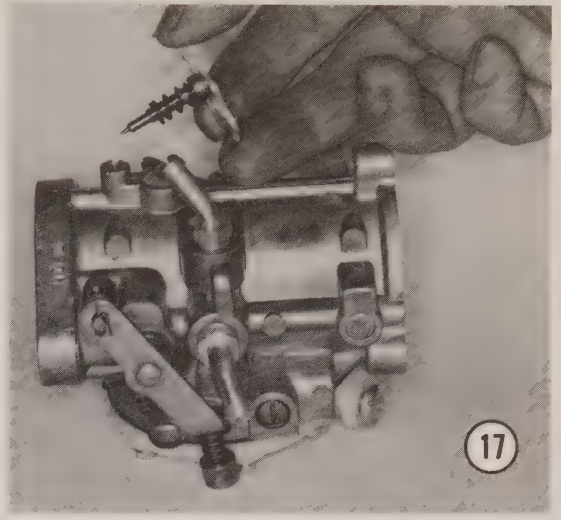
HD CARBURETOR — 1967-1970

1. Accelerating pump
2. Accelerating pump lever
3. Accelerating pump lever screw
4. Accelerating pump lever screw L.W.
5. Channel plug
6. Welch plug
7. Welch plug
8. Welch plug
9. Choke shaft friction ball
10. Choke shaft friction spring
11. Choke shutter (top)
12. Choke shutter spring
13. Choke shaft assembly
14. Choke shaft dust seal
15. Choke shutter (bottom)
16. Choke shutter screws
17. Diaphragm
18. Cover
19. Accelerating pump check ball retainer
20. Accelerating pump check ball
21. Diaphragm cover plug screw
22. Diaphragm cover screws
23. Diaphragm cover gasket
24. Economizer check ball
25. Fuel filter screen
26. Idle adjustment screw
27. Idle adjustment screw spring
28. Throttle stop screw
29. Throttle stop screw cup
30. Throttle stop screw spring
31. Throttle stop screw spring washer
32. Inlet control lever
33. Inlet control lever pin
34. Inlet control lever screw
35. Inlet needle and seat
36. Inlet needle seat gasket
37. Inlet control lever tension spring
38. Intermediate adjusting screw
39. Intermediate adjusting screw packing
40. Intermediate adjusting screw spring
41. Intermediate adjusting screw washer
42. Main jet
43. Main jet gasket
44. Main jet plug screw
45. Main nozzle check valve
46. Throttle shaft assembly
47. Throttle lever wire block screw
48. Dust seal
49. Washer
50. Throttle shaft spring
51. Throttle shutter
52. Throttle shutter screws
53. Gasket overhaul set
54. Overhaul repair kit

Disassembly

1. Remove idle mixture needle and spring (**Figure 17**).



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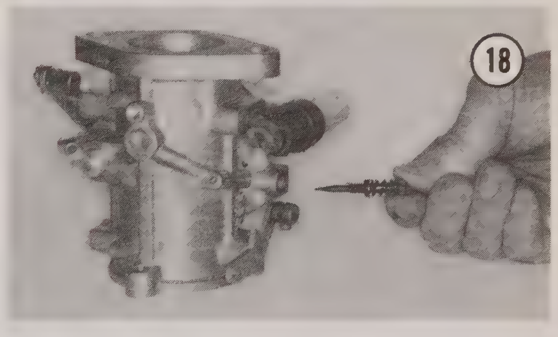
2. Remove intermediate mixture needle and spring (**Figure 18**).



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3. Remove 6 screws, then the diaphragm cover (**Figure 19**).

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4. Remove diaphragm and gasket together (**Figure 20**).

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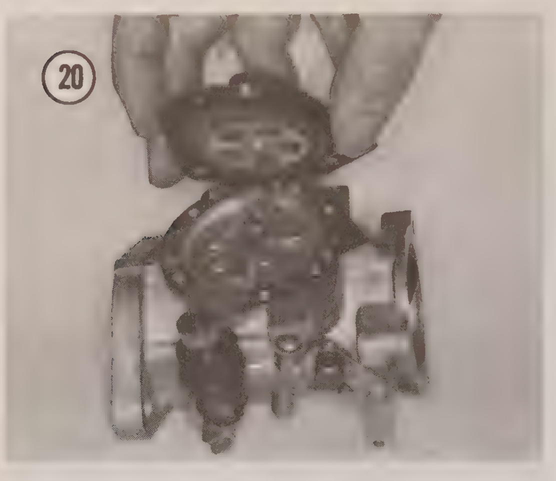

5. Separate diaphragm and gasket (**Figure 21**).

6. Remove accelerator pump plunger (**Figure 22**) after taking out its retaining screw.

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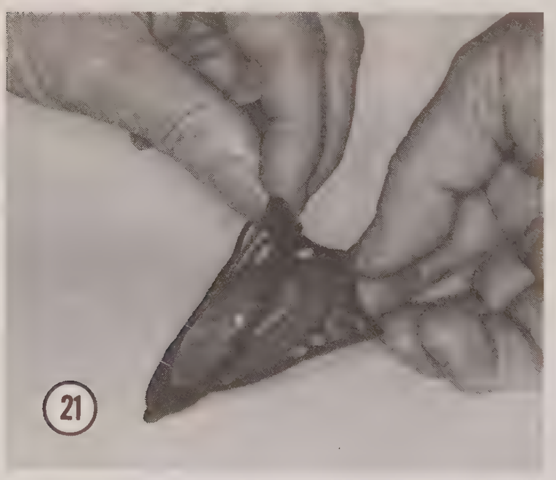

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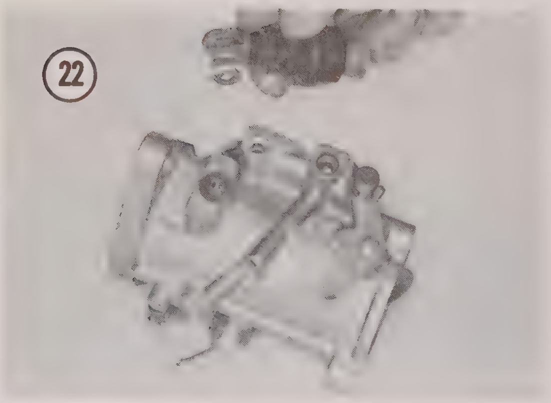

7. Remove accelerator pump channel plug screw (**Figure 23**).

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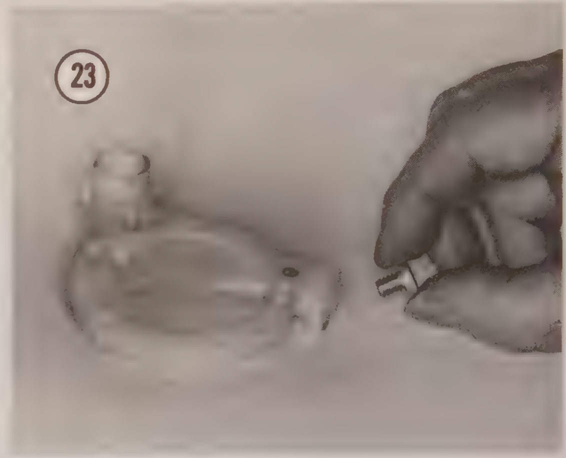

8. Remove metering lever pivot shaft retaining screw (**Figure 24**).

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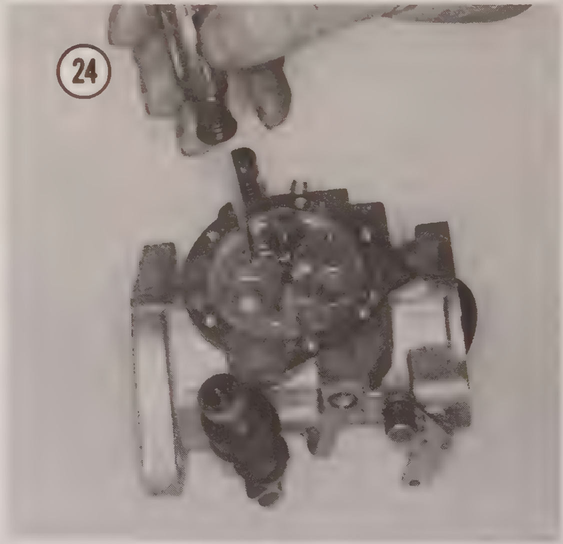


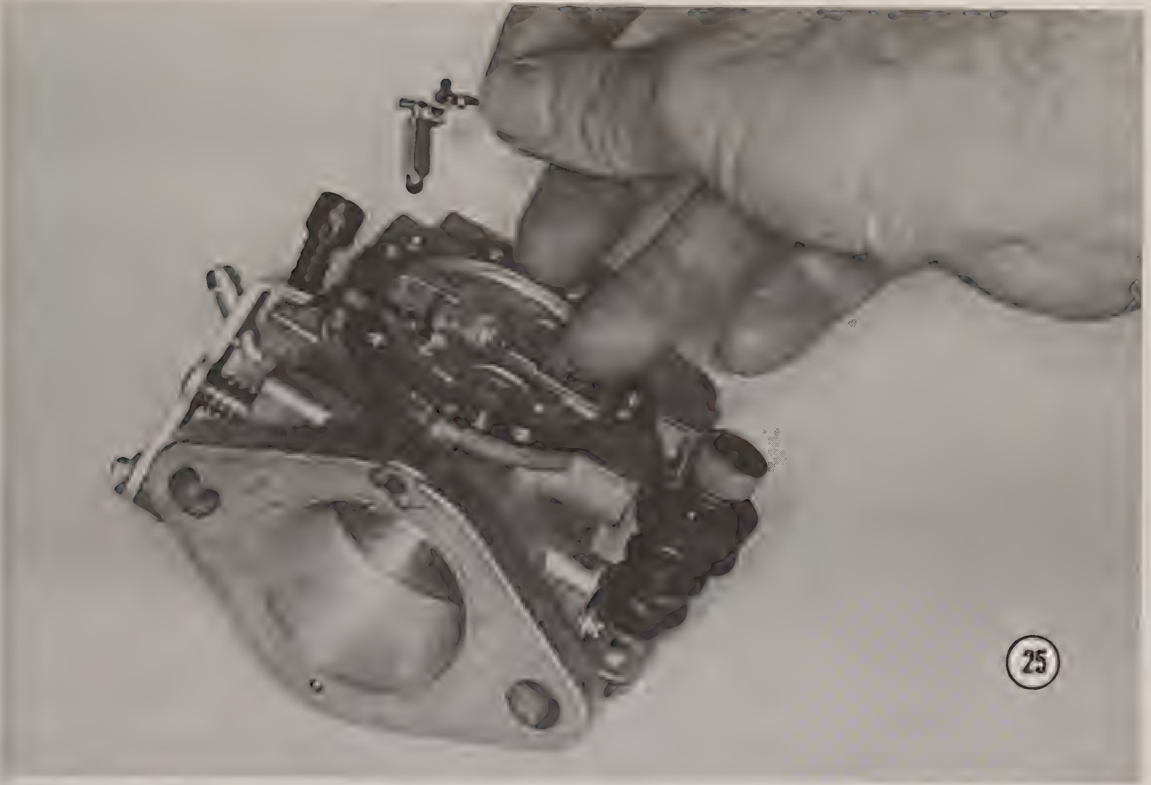
9. Remove metering lever shaft, metering lever, and needle as an assembly (**Figure 25**).

10. Remove the metering lever spring (**Figure 26**). Be sure that the spring engages the dimple on the metering lever upon reassembly.

11. Remove the inlet valve seat (**Figure 27**), then pull out its gasket, using a bent wire.

12. Remove the main jet plug screw (**Figure 28**).

13. Remove the main jet (**Figure 29**) and its gasket.



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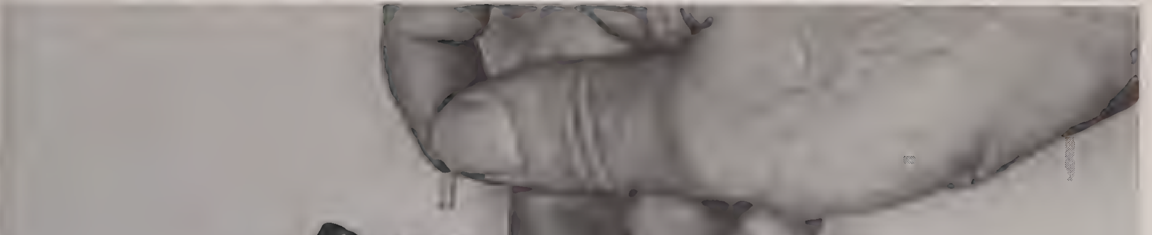

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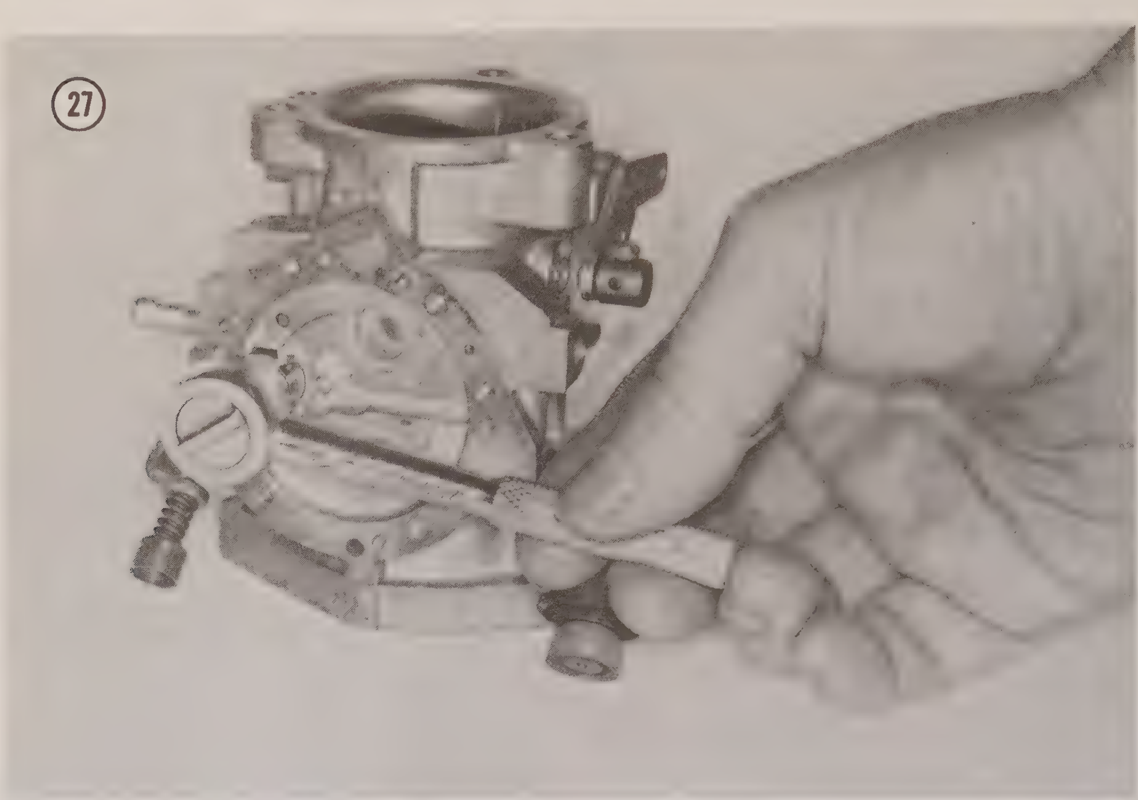

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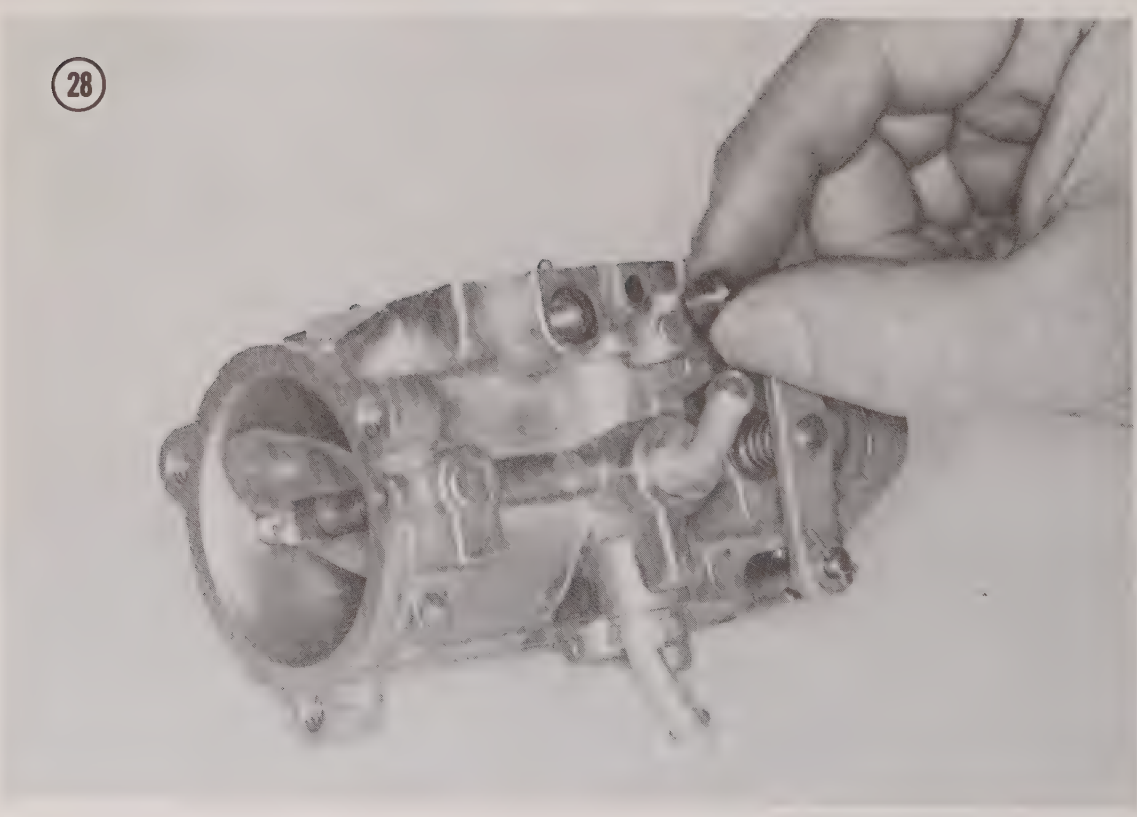
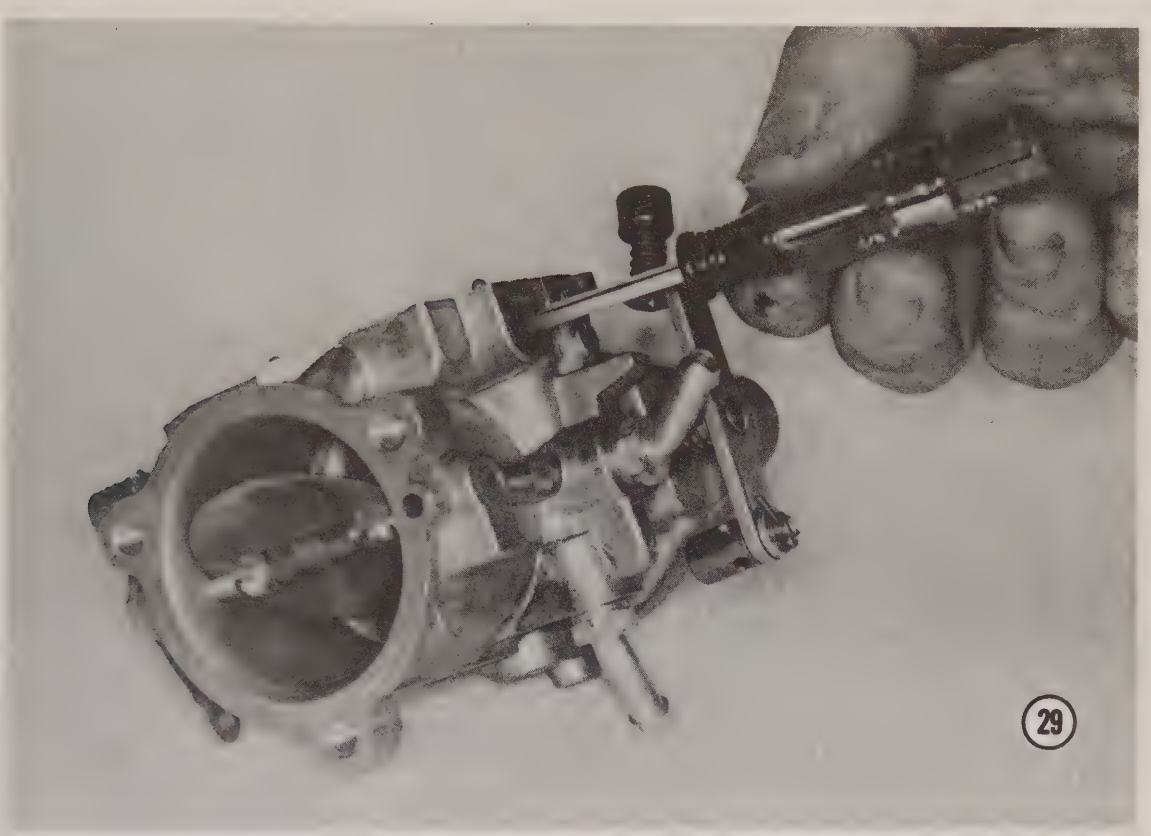
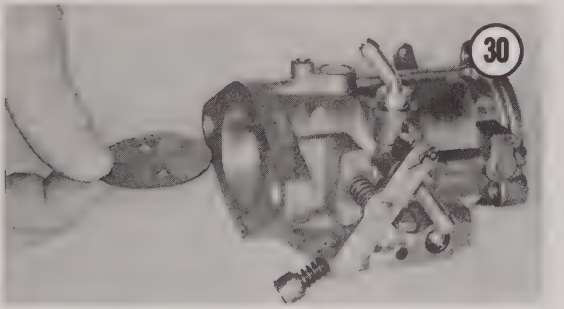




14. Carefully note how the throttle butterfly is installed, then remove both retaining screws and pull it out (**Figure 30**).



15. Pull out the throttle shaft (**Figure 31**). Don't lose the washers and dust seals.

16. Remove the choke valve (**Figure 32**) and its shaft.

There are 2 other jets, each located under welch plugs. These jets should not normally require removal. If removal is necessary, carefully drill a hole in each plug, then pry it out to gain access to the jets. Drive new plugs in flush.

Inspection

Clean all metal parts in carburetor cleaning solvent, then blow dry with compressed air. Do not use wire or metal tools to clean jets or passages; doing so may cause them to lose their calibration.

1. Be sure that accelerator pump lever is in good condition, and that its spring is in place. Be sure that accelerator pump check ball is free.
2. Inspect the diaphragm and its gasket. The diaphragm must not be stretched or rippled. Check that the metal washer attached to the diaphragm is firmly attached. If it rotates freely, diaphragm must be replaced. When reassembling diaphragm and gasket, be sure that gasket is between diaphragm and carburetor body.
3. Carefully examine idle needle and its seat for distortion or a cracked seat.
4. There must be no burrs on contact end of metering lever.
5. Be sure that seating end of inlet needles is in good condition.

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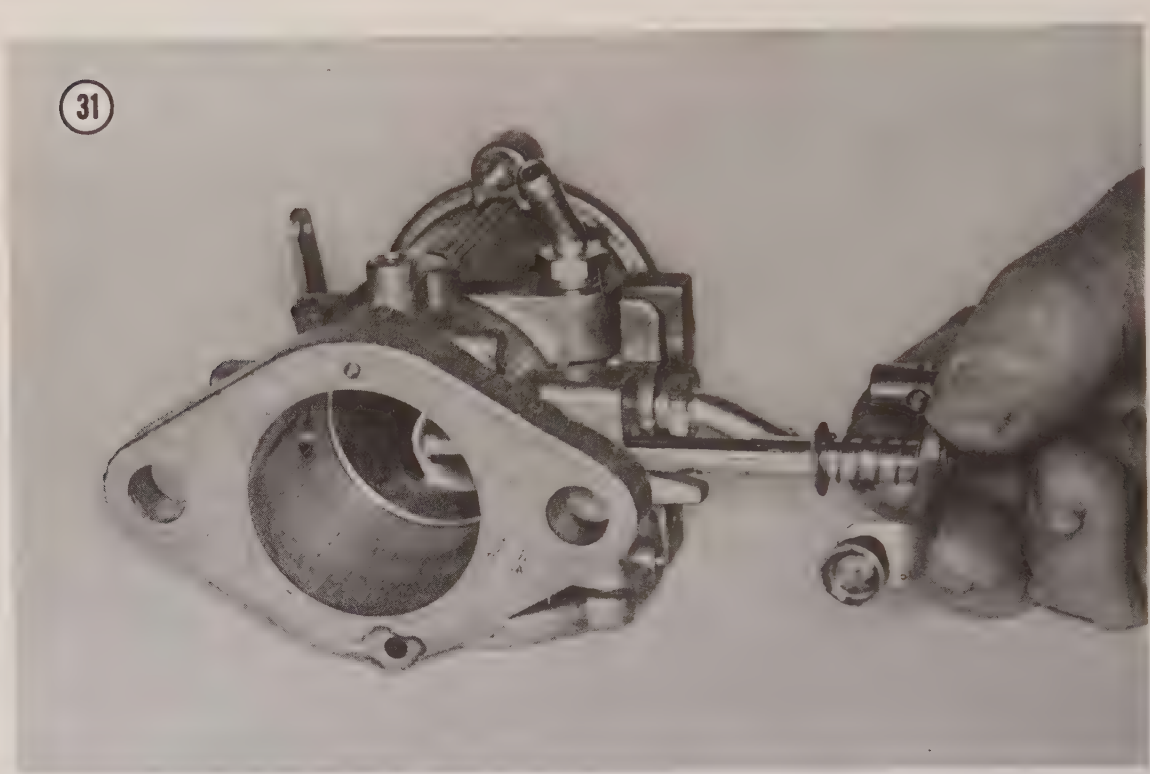

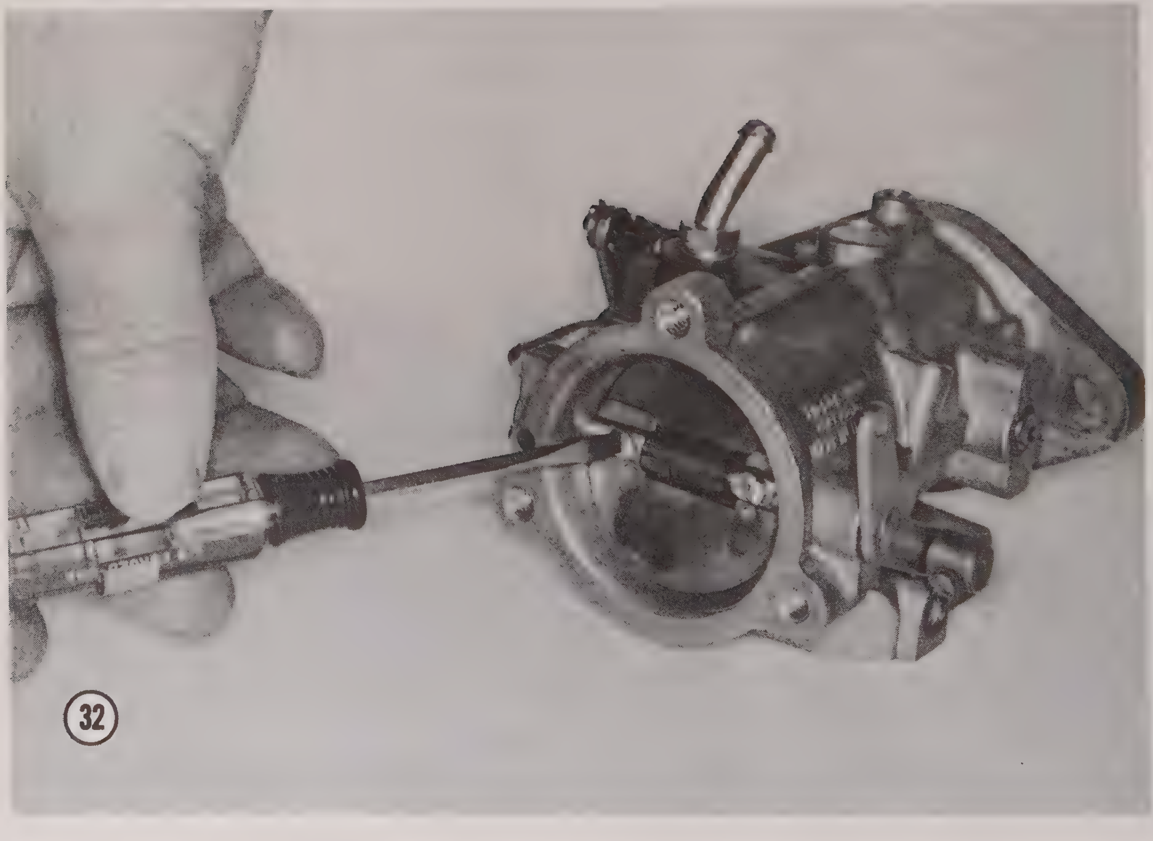

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Reassembly

Reverse the disassembly procedure to reassemble the carburetor. Take note of the following points.

1. Adjust the metering lever so that it is flush with the metering chamber floor.
2. Torque accelerator pump channel plug to 23-28 in.-lb.

Adjustment

Carburetor adjustment is performed with the carburetor installed on the motorcycle. Refer to **Figure 33**.

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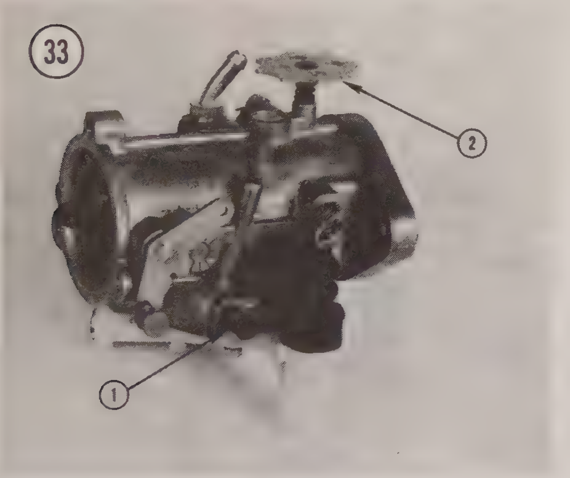

1. Intermediate needle
2. Low speed needle

1. Make sure that throttle wire from handlebar grip fully closes throttle lever on carburetor.
2. Turn low speed needle clockwise until it seats lightly, then back it out about ⅞ turn.
3. Turn intermediate needle in until it seats lightly, then back it out ⅞ turn also.
4. Start engine and warm it thoroughly.
5. Adjust idle speed screw so that engine runs at approximately 2,000 rpm.
6. Slowly turn intermediate needle in whatever direction is necessary to produce the highest engine speed without missing or surging. Then turn intermediate needle counterclockwise ⅛ turn from that point.
7. Back off idle speed screw until engine idles at 900-1,100 rpm.
8. Alternately adjust low speed needle and idle speed screw to produce a smooth idle at 900-1,100 rpm.

MODEL DC CARBURETOR

Model DC carburetors were installed on 1966 models. This carburetor is equipped with adjustable high- and low-speed needles. There are no moving parts in this carburetor other than throttle and float assemblies.

Figure 34 is an exploded view of this carburetor. Refer to that illustration during service.

Disassembly

1. Remove throttle body screws and lockwashers (1), gasket (2), plug (3), low speed needle (4), washer (5), and spring (6).
2. Remove screws (7) and disc (8).
3. Remove screw (9) from throttle lever (10), then take off throttle shaft spring (11), throttle shaft washer (12), and pull out the throttle shaft (13).
4. Remove bowl mounting screws (16), then pull off bowl (17). Also remove gasket (18).
5. Remove float nut (19) from float rod, then pull off float (20).
6. Remove float valve and seat assembly (21).
7. Remove float lever screw and washers (22), then float lever and bracket assembly (23).
8. Remove support bracket nut and lockwasher (24) and support bracket (25). This step does not apply to all models.
9. Remove bowl nut (26) and gasket (27).

> NOTE: *If idle tube (28) comes out bowl nut (27), do not attempt to remove it. Usually the idle tube will remain in the carburetor body.*

10. Gently pull out idle tube (28) from carburetor body by gently tugging and moving it from one side to the other.
11. Unscrew main nozzle (29). It is recommended that a screwdriver be ground to fit exactly. The screwdriver slot in the main jet is 0.051 in. wide.

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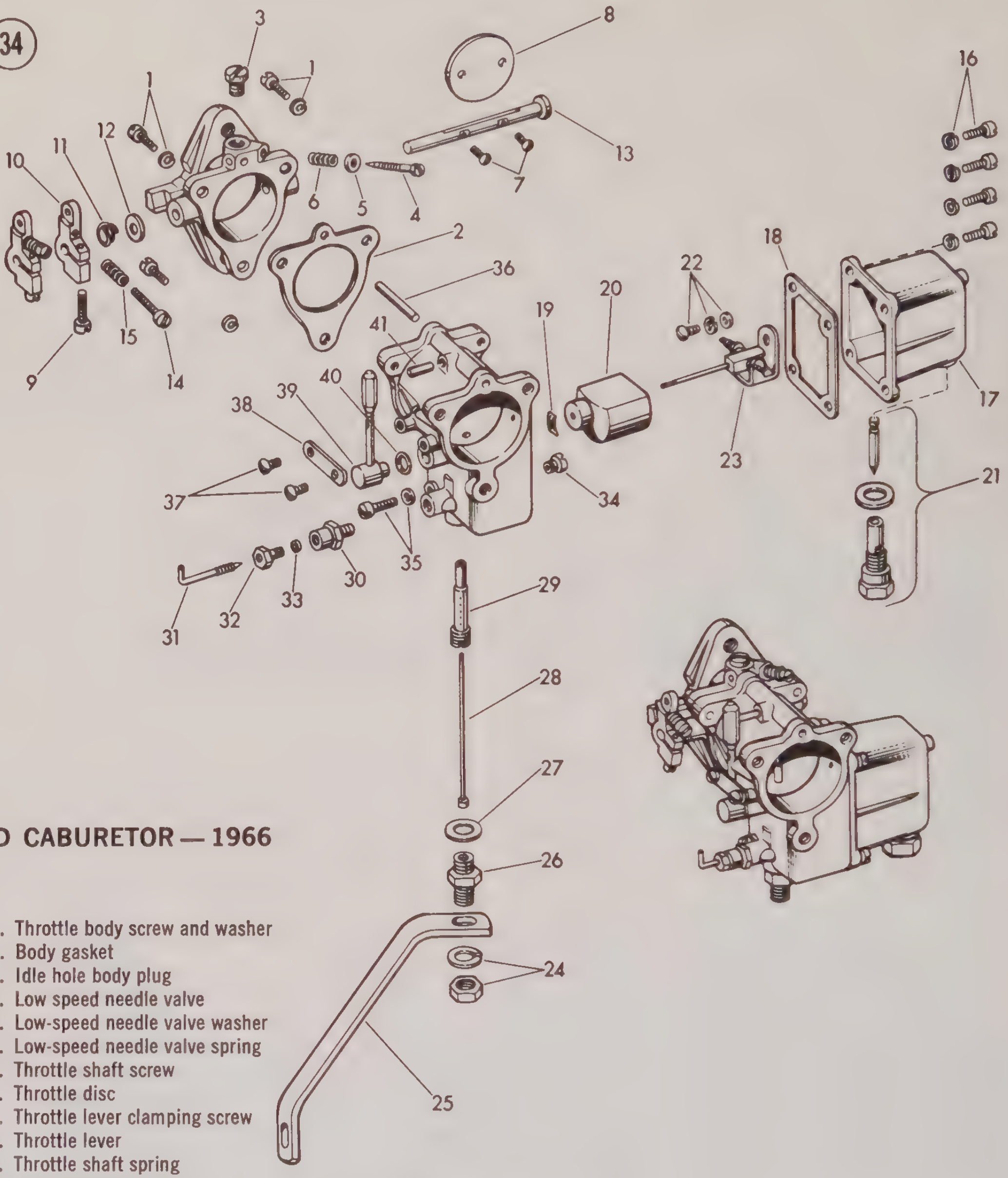

HD CABURETOR — 1966

1. Throttle body screw and washer
2. Body gasket
3. Idle hole body plug
4. Low speed needle valve
5. Low-speed needle valve washer
6. Low-speed needle valve spring
7. Throttle shaft screw
8. Throttle disc
9. Throttle lever clamping screw
10. Throttle lever
11. Throttle shaft spring
12. Throttle shaft washer
13. Throttle shaft
14. Throttle lever stop screw
15. Throttle lever stop screw spring
16. Bowl mounting screw
17. Bowl
18. Bowl gasket
19. Float nut
20. Float
21. Float valve and seat
22. Float lever screw and washers
23. Float lever and bracket assembly
24. Support bracket nut and lockwasher
25. Support bracket
26. Bowl nut
27. Bowl nut gasket
28. Idle tube assembly
29. Main nozzle
30. High-speed needle valve extension housing
31. High-speed needle valve
32. High-speed needle valve packing nut
33. High-speed needle valve packing
34. Carburetor jet
35. Drain plug and gasket
36. Idle passage tube
37. Throttle shaft screw
38. Vent clamp
39. Vent housing
40. Vent gasket
41. Idle bleed tube

12. Remove high-speed needle extension housing (30), then needle (31), packing nut (32), and packing (33).

13. Remove jet (34).

14. Remove drain plug (35) and its gasket.

15. Remove idle passage tube (36).

16. Remove screws (37) and clamp (38), then take off vent housing (39), gasket (40), and idle bleed tube (41).

Inspection

1. Clean all parts except gaskets and float in carburetor cleaner. Dry with compressed air. Replace shaft (13) if it is worn or loose (0.002 in. in clearance) in its bearings.

2. If after long service, idle port holes next to throttle disc (8) become crusted, and solvent does not clean them, open them up with a drill of the exact size specified in **Table 1**.

Table 1 IDLE PORT CLEANING

Model	Drill Size
DC-1, -1L, -1M, -10	70 (0.028 in.)
DC-2	56 (0.0465 in.)

Use only the exact drill specified, and take extreme care not to enlarge the holes.

3. Clean idle jet hole with a No. 57 (0.043 in.) drill, and the angular hole it meets with a No. 52 (0.043 in.) drill. Again take extreme care during this step.

4. Clean nozzle bleed holes with a No. 54 (0.055 in.) drill. Clean the main passage with a No. 17 (0.173 in.) drill.

5. Clean high speed needle seat holes with a No 55 (0.052 in.) drill for all models but DC-2. On model DC-2, use a No. 70 (0.028 in.) drill.

6. Be sure that both carburetor body vents are open.

7. Replace needle valve and seat (21) if the assembly leaks.

Adjusting Float Rod

1. Assemble float valve and seat (21).

2. Install screw (22), but do not tighten it, so that bracket may be adjusted.

3. Insert float valve and seat assembly (21) partially into bowl (17), then align float lever fingers with the groove on the float valve. Screw float valve assembly into bowl.

> NOTE: *Never screw valve and seat assembly into bowl with bowl attached to carburetor body. Fingers on lever will be damaged if they are not engaged properly.*

4. Refer to **Figure 35**. Hold bowl inverted, then measure distance between top of float rod and outer edge of bowl flange opposite fuel inlet fitting. Note that this measurement must be made just as float valve seats lightly. This point may be determined by moving lever up and down gently.

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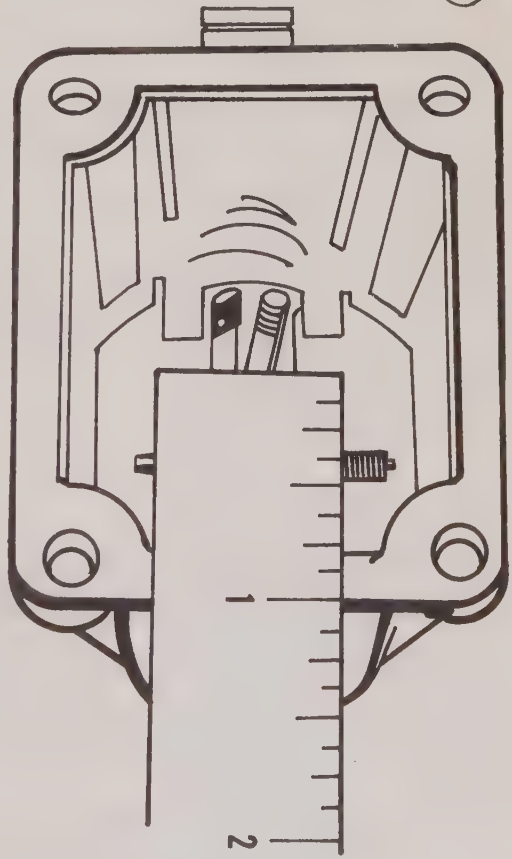

If measurement obtained is not 1-1/16 in., adjust slotted lever bracket, then tighten screw (22). Recheck and readjust as required.

Reassembly

Reassemble the carburetor in reverse order of disassembly. Observe the following notes.

1. Assemble high speed needle (31), packing (33), and packing nut (32), and housing (30). Tighten packing nut (32) just enough to keep needle (31) from turning freely.

CAUTION

When installing this assembly into main body, always back out needle (31) so that its point will not enter the valve hole in the main body.

2. With carburetor body inverted, drop in idle tube (28), small end first. It may be necessary to jiggle the body until the idle tube locates itself in position. Then press on end of tube until it seats.
3. If it is necessary to replace throttle disc (8), use only a replacement disc bearing the same number on its face.
4. Install idle passage tube (36) with its chamfered end out.
5. Carburetor-to-manifold flange gasket thickness is critical. Always use a new gasket, and be sure that mounting screw does not bottom against throttle body screw (1).
6. Adjust carburetor.

Carburetor Adjustment

Adjust the carburetor with the engine fully warm. As an initial adjustment, turn in low speed needles (4) until it seats lightly, then back it out 1½ turns. Turn high speed needle (31) in until it seats lightly, then back it out one turn.

1. Make sure that throttle cable is adjusted so that throttle lever (10) opens and closes freely with handlebar grip movement.
2. Start engine and warm it thoroughly.
3. With engine idling, turn low speed needle (4) in ⅛ turn at a time until engine falters, then back it out ⅛ turn, or until engine runs regularly at idle speed with spark fully advanced.
4. Adjust idle speed screw (14) as required until engine idles at 900-1,100 rpm.

CAUTION

Never adjust engine idle to slowest possible rpm. Very slow idle results in bearing wear, oil consumption, and poor acceleration from idle.

5. Repeat Steps 3 and 4 as required.
6. Operate motorcycle at various speeds between 20 mph and maximum speed. Turn high speed needle (31) in or out a little bit at a time until best overall performance is obtained. This point should occur with needle backed out between ¾ and 1¼ turns open.

MODEL M CARBURETOR

Model M carburetors are used on 1965 and earlier models. Two needle valves control low and high speed mixture. **Figure 36** is an exploded view of this carburetor. Refer to it during disassembly and service.

Disassembly

1. Remove locknut (1), gasket (2), spring (3), and nozzle (4).
2. Remove bowl (5) and its gasket (6).
3. Remove float valve seat (7) and its gasket (8).
4. Unscrew float lever pin (9), then remove float (10), lever (11), and float valve (12).
5. Loosen screw (13), then remove lever (14), arm (15), and spring (16).
6. Remove screws (17), then slip throttle disc (18) from slot in shaft. Remove shaft (19).
7. Remove low speed needle (20).
8. Remove high speed needle (21).
9. Remove screw (22), lever (23), spring (24) and collar (25).
10. Remove nut and washer (26), stop (27), ball (28), and spring (29).
11. Remove screws (30) and disc (31). Pull out shaft (32).
12. Remove plug (33), screws (34), and jet (35).

Inspection

Clean all parts except float and gaskets in carburetor cleaning solvent, then blow dry with

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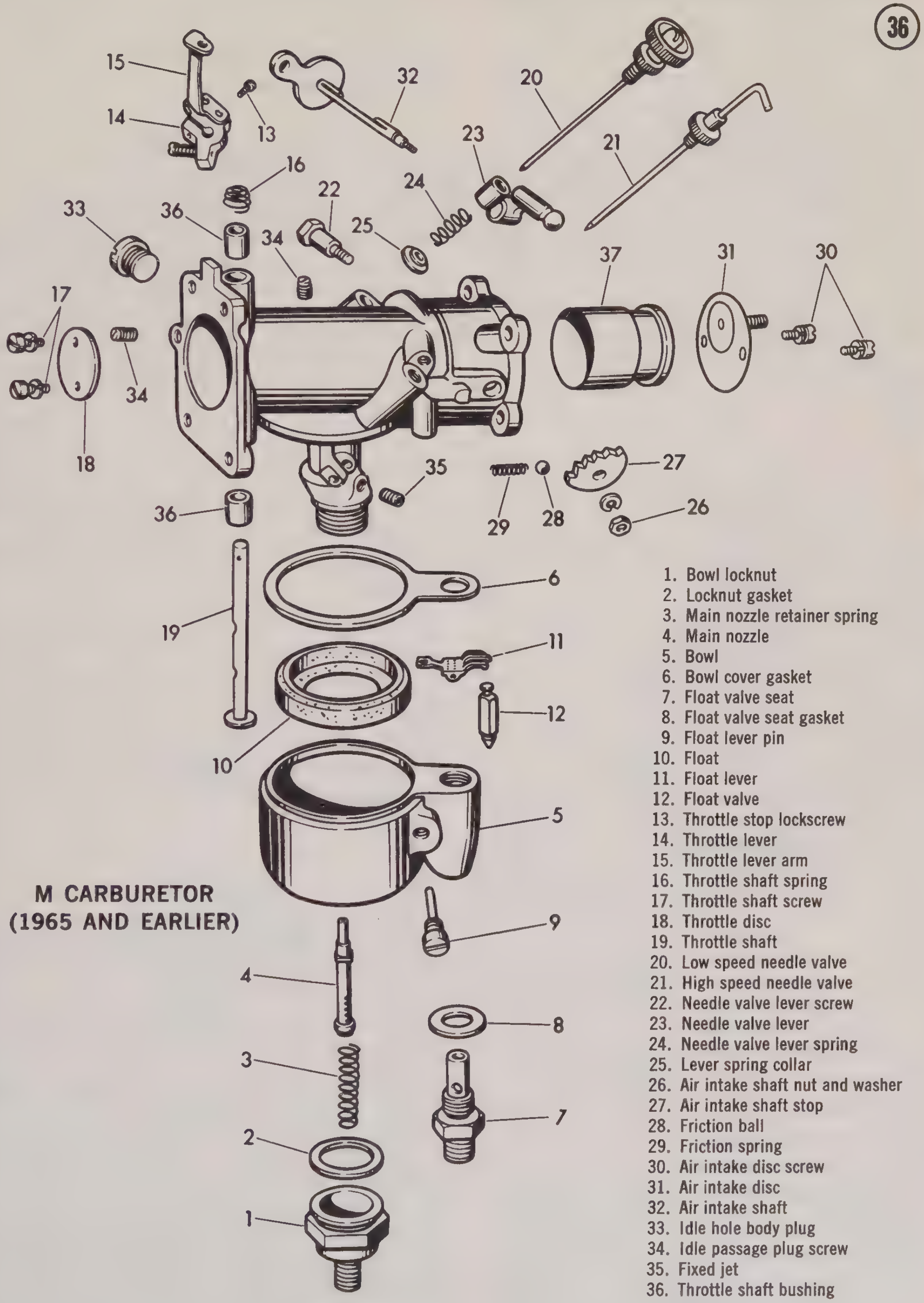

M CARBURETOR
(1965 AND EARLIER)

1. Bowl locknut
2. Locknut gasket
3. Main nozzle retainer spring
4. Main nozzle
5. Bowl
6. Bowl cover gasket
7. Float valve seat
8. Float valve seat gasket
9. Float lever pin
10. Float
11. Float lever
12. Float valve
13. Throttle stop lockscrew
14. Throttle lever
15. Throttle lever arm
16. Throttle shaft spring
17. Throttle shaft screw
18. Throttle disc
19. Throttle shaft
20. Low speed needle valve
21. High speed needle valve
22. Needle valve lever screw
23. Needle valve lever
24. Needle valve lever spring
25. Lever spring collar
26. Air intake shaft nut and washer
27. Air intake shaft stop
28. Friction ball
29. Friction spring
30. Air intake disc screw
31. Air intake disc
32. Air intake shaft
33. Idle hole body plug
34. Idle passage plug screw
35. Fixed jet
36. Throttle shaft bushing
37. Venturi

compressed air. Blow out all passages. Never scrape away deposits with any metal tool.

Check that shaft (19) is not loose in bushings (36). If clearance exceeds 0.003 in., replace bushings. Line ream replacement bushings after installation, using a 0.250 in. drill.

Replace float valve and seal if they leak. To check for leakage, assemble items 7 through 12 into bowl (5). Invert bowl so that float valve closes, then suck on bottom of float valve seat (7).

Replace float (10) if it is soaked with fuel or damaged. To replace it, refer to **Figure 37**.

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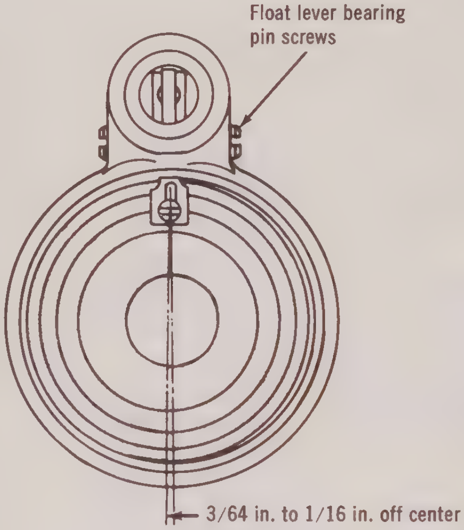
Float lever bearing pin screws
3/64 in. to 1/16 in. off center

Top view of carburetor bowl showing float mechanism and offset of float

1. Cut cement seal from around screw which secures float to float lever.
2. Replace float, but leave screw loose.
3. Position bowl upright, with fuel inlet away from you.
4. Pull float toward you to limit of slot in float lever, and about 1/16 in. to left of centerline. This operation provides clearance for float in float bowl.
5. Tighten float screw.
6. Seal screw to float with any cement which will not be attacked by gasoline.
7. Adjust float level.

Float Level Adjustment

Refer to **Figure 38**. With float bowl inverted, measure distance from lip of float bowl to top of float at a point directly opposite float lever. This distance should be exactly ¼ in.

If not exactly ¼ in., remove float lever and bend it as required, rechecking each time. Do not bend lever when it is installed in bowl.

Reassembly

Assemble carburetor in inverse order of disassembly, observing the following notes.

1. Install venturi (37) with small end toward air intake.
2. Be sure that disc (18) seats all around the carburetor throat.
3. Throttle lever and shaft should operate with slight drag. If operation is too loose, loosen screw (13), then compress parts on shaft with fingers while retightening screw.
4. Adjust carburetor.

Carburetor Adjustment

Refer to **Figure 39** during carburetor adjustment. Final adjustment must be made with the engine warm.

1. Turn high speed needle (1) in until it seats lightly, then back it out 2 turns.
2. Turn low speed needle (2) in until it seats lightly, then back it out 5 turns.
3. Start engine, then ride the bike long enough to warm it thoroughly.
4. With engine at operating temperature and spark advanced, turn low speed needle (2) in one notch at a time until engine falters and misses. Then back it out 5 to 10 notches, or until engine runs smoothly with throttle closed and spark advanced.

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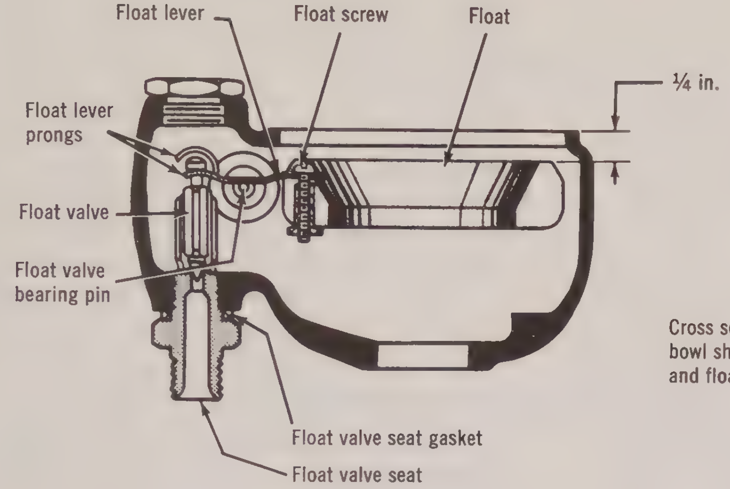
Float lever
Float screw
Float
¼ in.
Float lever prongs
Float valve
Float valve bearing pin
Float valve seat gasket
Float valve seat

FLOAT LEVEL ADJUSTMENT

Cross section of carburetor bowl showing float mechanism and float setting

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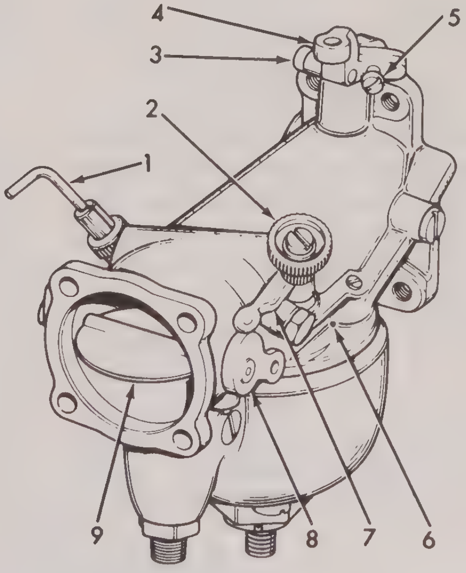
CARBURETOR ADJUSTMENT



1. High speed needle
2. Low speed needle
3. Throttle lever lockscrew
4. Throttle lever
5. Throttle stop screw
6. Carburetor bowl vent
7. Low speed needle lift lever
8. Choke lever
9. Choke disc

5. Adjust engine idle to 900-1,100 rpm by turning throttle stop screw (5).

6. Repeat Steps 4 and 5. Overall operation will be better with idle mixture slightly rich (counterclockwise movement of needle).

7. Retard spark fully. Engine will continue to run evenly, but slower, if adjustment is correct.

8. Operate motorcycle at various road speeds, then turn high speed needle (1) in or out as required to obtain best overall performance.

NOTE: If you own a 1976 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER SIX

ELECTRICAL SYSTEM

This chapter discusses operating principles and troubleshooting procedures for Harley-Davidson ignition, charging, starting, signal, and lighting systems.

IGNITION SYSTEM

Harley-Davidsons are equipped with a battery ignition system. This system functions in a manner similar to that of a conventional automobile.

Figure 1 illustrates the ignition system. The breaker cam rotates at ½ crankshaft speed. There are 2 lobes on the cam; the narrow lobe times the front cylinder and the wide lobe times the rear cylinder. A single coil fires both sparks simultaneously, but one spark always occurs in a cylinder which is on its exhaust stroke.

When the breaker points are closed, current flows from the battery through the primary winding of the ignition coil, thereby building a magnetic field around the coil. As the points open, the magnetic field collapses. When the

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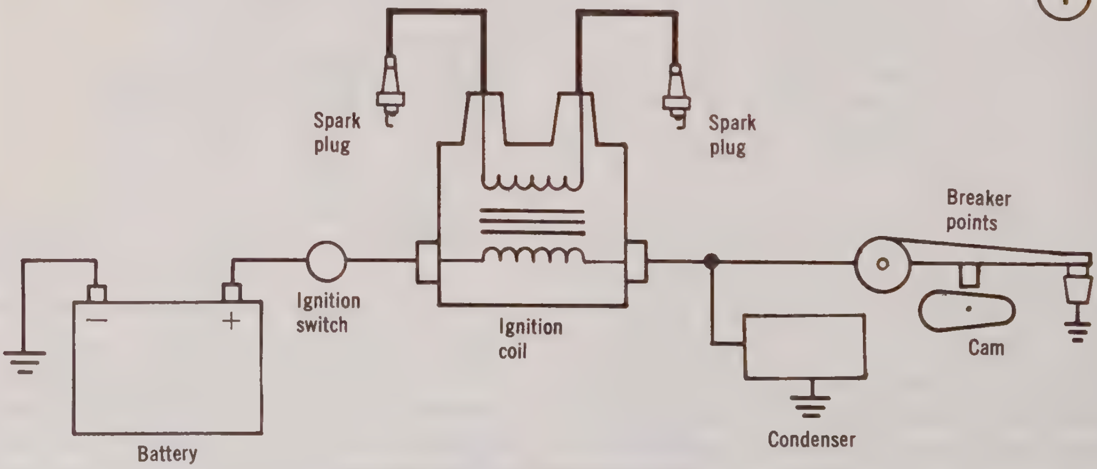

BATTERY IGNITION SYSTEM

field collapses, a very high voltage (up to approximately 15,000 volts) is induced in the secondary winding of the ignition coil. This high voltage is sufficient to jump the gap at each spark plug.

The condenser assists the coil in producing high voltage, and also serves to protect the points. Inductance of the ignition coil primary tends to keep a surge of current flowing through the circuit even after the points have started to open. The condenser stores this surge and thus prevents arcing at the points.

IGNITION TROUBLESHOOTING

Ignition system problems can be classified as no spark, weak spark, or improperly timed spark. These conditions may affect either or both cylinders. **Table 1** lists common causes and remedies for ignition system malfunctions.

Table 1 IGNITION TROUBLESHOOTING

Symptom	Probable Cause	Remedy
No spark or weak spark, both cylinders	Discharged battery	Charge battery
	Defective fuse	Replace
	Defective main switch	Replace
	Loose or corroded connection	Clean and tighten
	Broken wire	Repair
Misfires	Dirty spark plug	Clean or replace spark plug
	Spark plug is too hot	Replace with colder spark plug
	Spark plug is too cold	Replace with hotter spark plug
	Spring on breaker points is weak	Replace points, adjust timing
	Incorrect timing	Adjust timing

Ignition failures are easy to isolate.

1. Rotate the engine until the points are closed.
2. Disconnect the high voltage lead from the affected spark plug and hold it ¼ in. away from the cylinder head. It may be necessary to fabricate a suitable extender to fit under the spark plug cap.
3. Turn on the ignition. With an insulated tool, such as a piece of wood, open the points. A fat, blue-white spark should jump from the spark plug lead to the cylinder head. If the spark is good, clean or replace the spark plug. If there is no spark, or if it is thin, yellowish, or weak, continue with Step 4.
4. Connect the leads of a voltmeter to the wire on the points and to a good ground. Turn on the ignition switch. If the meter indicates more than ⅛ V, the problem is defective points. Replace them.
5. Open the points with an insulated tool, such as a piece of wood. The voltmeter should indicate battery voltage. If not, there are 3 possibilities to consider:
   a. Shorted points
   b. Shorted condenser
   c. Open coil primary circuit
6. Disconnect the condenser and the wire from the points. Connect the ungrounded (positive) voltmeter lead to the wire which was connected to the points. If the voltmeter does not indicate battery voltage, the problem is an open coil primary circuit. Replace the suspected coil with a known good one. If that coil doesn't work, the problem is in the primary wiring.
7. If the voltmeter indicated battery voltage in Step 5, the coil primary circuit is OK. Connect the positive voltmeter lead to the wire which goes from the coil to the points. Block the points open with a business card or similar piece of cardboard. Connect the negative voltmeter lead to the movable point. If the voltmeter indicates any voltage, the points are shorted and must be replaced.
8. If the foregoing checks are satisfactory, the problem is in the coil or condenser. Substitute each of these separately with a known good one to determine which is defective.

Ignition Coil

The ignition coil (**Figure 2**) is a form of transformer which develops the high voltage required to jump the spark plug gap. The only maintenance required is that of keeping its electrical connections clean and tight, and occasionally checking to see that it is mounted securely.

If coil condition is doubtful, there are several checks which should be made.

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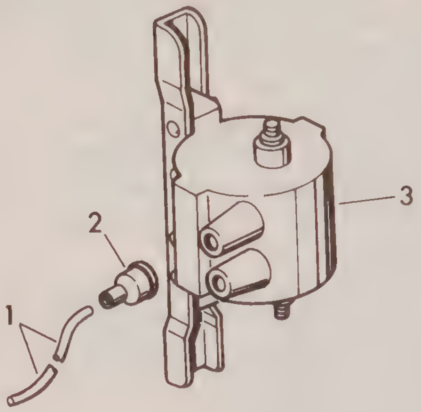

1. Spark plug cable
2. Spark plug cable boot
3. Ignition coil

1. Using an ohmmeter, measure resistance between both primary terminals (**Figure 3**). Resistance should be approximately 5 ohms.

2. Measure resistance between both high voltage terminals (**Figure 4**). Resistance should be approximately 11,000 ohms.

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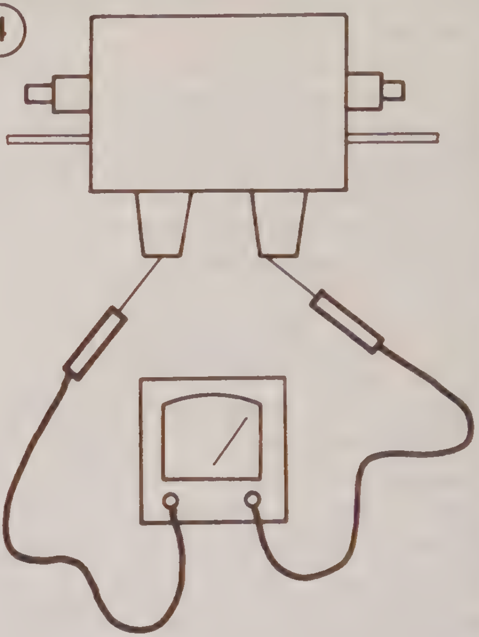

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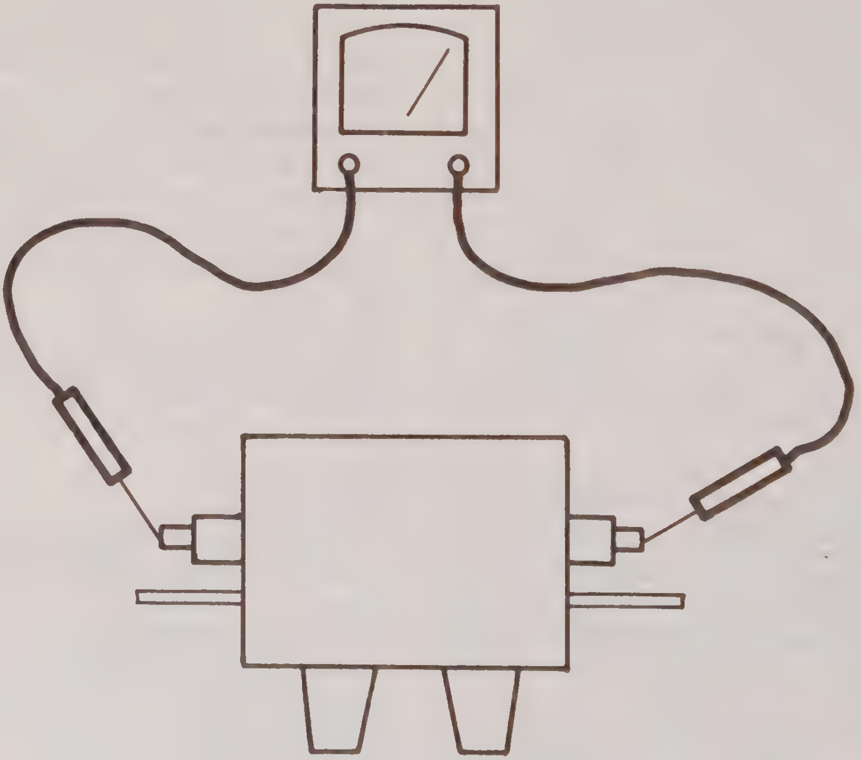

3. Using the highest ohmmeter range, determine that there is no continuity between either primary and either high voltage terminal. See **Figure 5**.

4. If these checks don't reveal any defects, but coil condition is still doubtful, substitute a known good one.

On older type coils (**Figure 6**), spark plug wires (1) may be replaced if necessary. To do so, proceed as follows.

1. Have new cables ready, with ends trimmed and rounded so that they will slip easily into holes in coil.
2. Warm coil by turning ignition ON (breaker points must be closed).
3. Clip off old cable (1) at spark plug end, then transfer cable packing nut (4), cable washer (3), and new cable packing washer (2) to the replacement cable. Dip coil end of replacement cable in very light oil.
4. Quickly pull out old cable and insert new cable, making sure that it bottoms fully into coil.
5. After installation, tighten cable packing nut (4).

It may happen that sealing compound becomes too hot and softened to the extent that it prevents new cables from being fully inserted.

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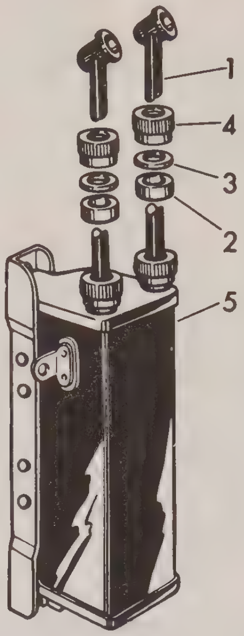

1. Spark plug cable
2. Cable packing washer
3. Cable washer
4. Cable packing nut
5. Ignition coil

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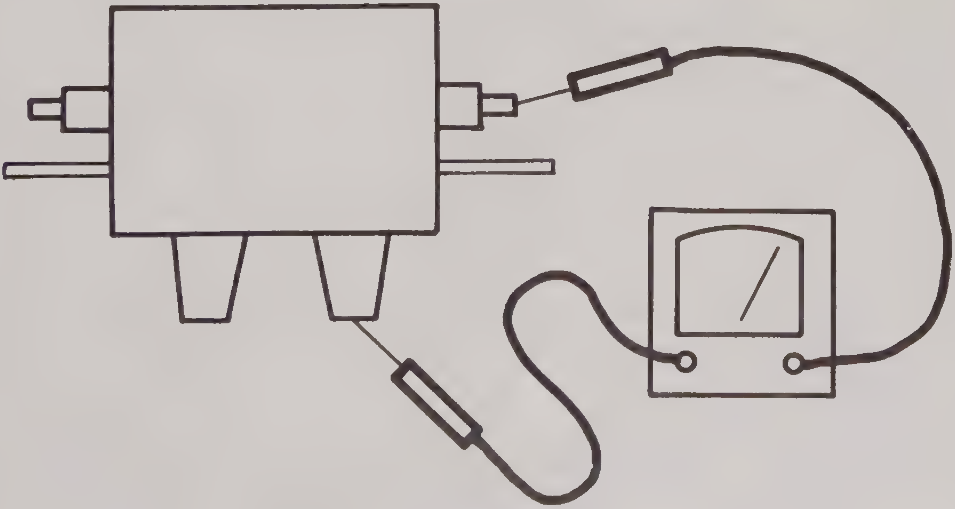

In that case, allow coil to cool, then make new holes by using a piece of tubing with teeth cut into one end as a saw. Diameter of this tubing should be slightly larger than that of the replacement cables.

Be sure to connect primary wires correctly when replacing the coil.

CIRCUIT BREAKER

Models to 1969 were equipped with manual advance, automatic advance, or dual contact circuit breakers, shown in **Figure 7**. Beginning with 1970, the circuit breaker was incorporated into the right gearcase cover (**Figure 8**). Refer to the applicable illustration during removal and service procedures.

Removal (1969 and Earlier Models)

1. On 1962 and earlier models, remove front cylinder head.
2. Thoroughly clean circuit breaker area with compressed air.
3. On manual advance models, disconnect advance cable from adjusting stud (17).
4. Remove cover (1).
5. Remove base (10) and retainer (20).
6. Remove 2 screws (23), then lift shaft and housing from gearcase cover.

Installation (1964 and Earlier Models)

1. Remove spark plugs.
2. Remove timing inspection plug from left side of engine.
3. Telescope front cylinder intake valve pushrod cover (closest to carburetor) so that pushrod operation can be observed.
4. Turn engine in its normal running direction until front piston is on its compression stroke, then continue turning slowly until advanced timing mark on flywheel is centered in inspection hole (**Figure 9**). The cylinder is on its compression stroke just after its intake valve closes.

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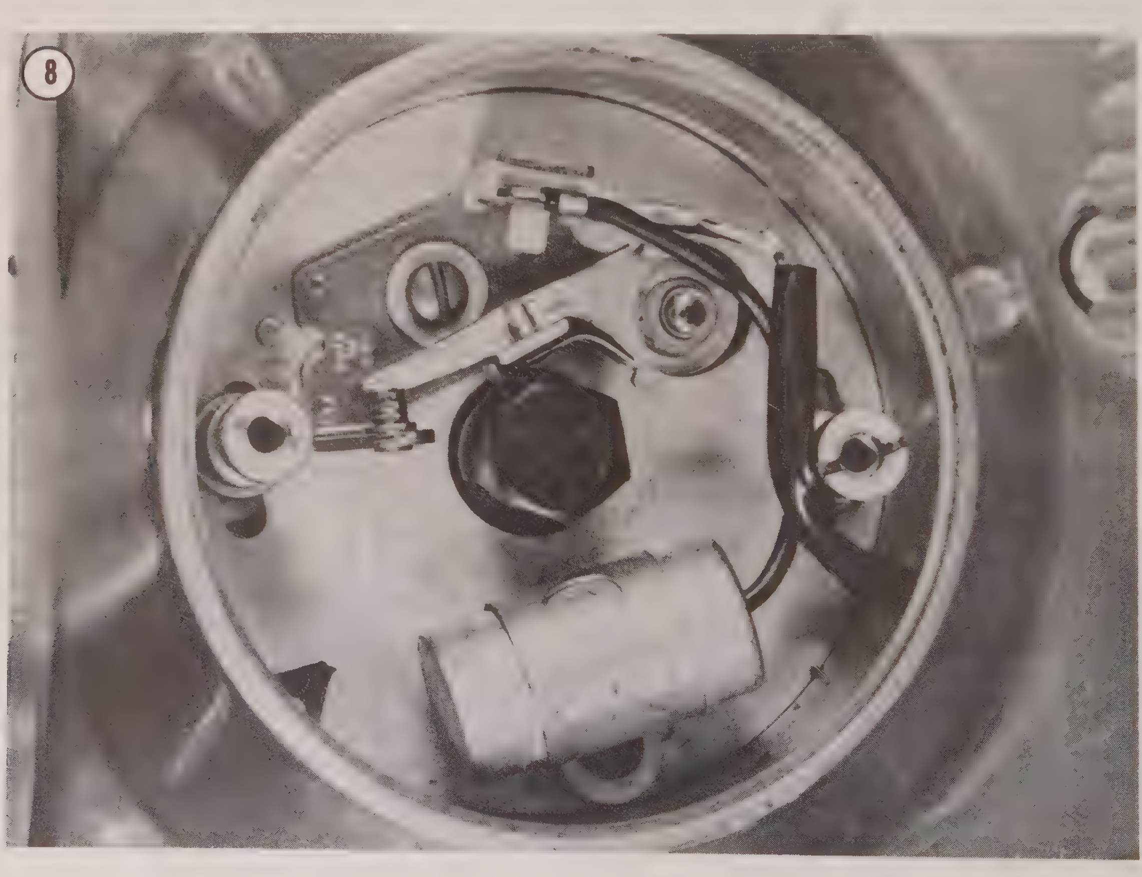
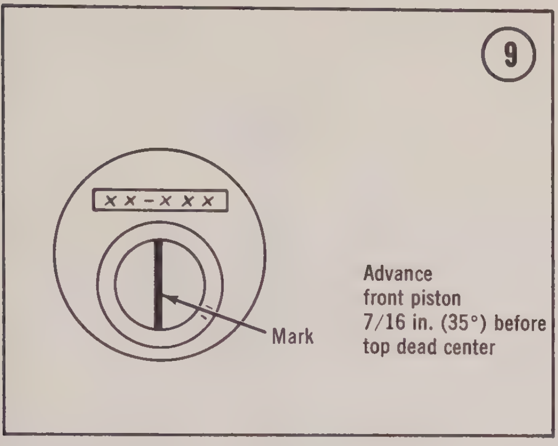
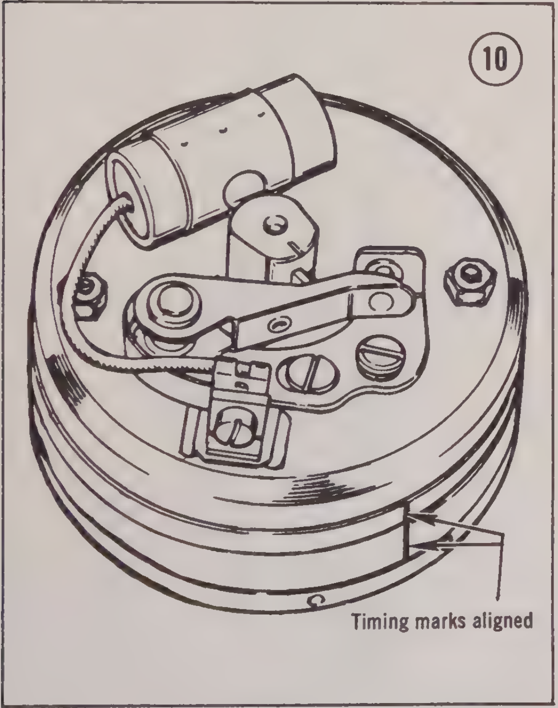


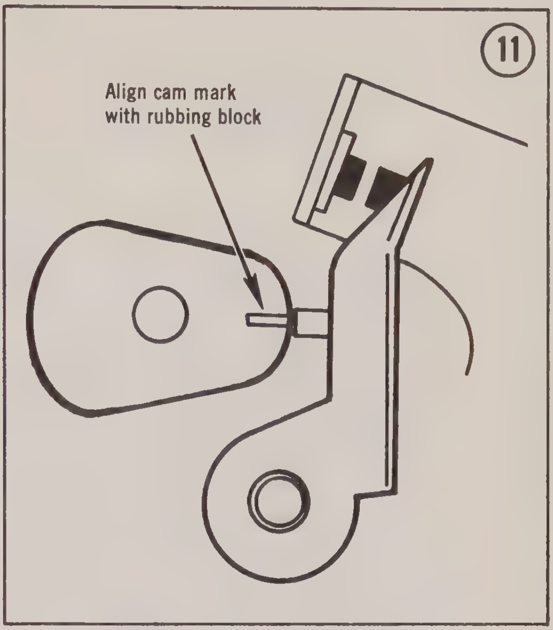


5. Make sure that timing mark on circuit breaker base aligns with end of adjusting stud plate (**Figure 10**).



6. Install new gasket (23 or 23A), using gasket sealing compound.

7. Insert shaft and stem assembly into gearcase cover, making sure that cable (12) is inserted into hole of stem flange. Before engaging drive gear, turn shaft counterclockwise approximately 60 degrees from position where mark on cam (**Figure 11**) aligns with fiber rubbing block on movable breaker contact.



8. Install both crankcase screws snugly, but do not tighten them.

9. Temporarily position base on shaft and stem assembly in full advance position (full counterclockwise).

10. Observe how closely mark on cam aligns with rubbing block. If it does not align, lift shaft and stem assembly from gearcase. Turn shaft gear one tooth, then again check alignment. Repeat until cam mark aligns closely with the rubbing block.

11. Tighten both crankcase screws.

12. Wrap cable clockwise around camshaft, and install base retainer over wire, with retainer end facing down and toward front cylinder.

13. Install cover retainer if it was removed.

14. Adjust ignition timing. Refer to Chapter Two for procedure.

> NOTE: *On models with dual contact breakers, mark on cam lobe must align with rubbing block for front cylinder breaker points. These breaker points are identified by letter "F".*

Installation (1965 Models)

1. Remove both spark plugs.

2. Remove timing inspection plug from left side of engine.

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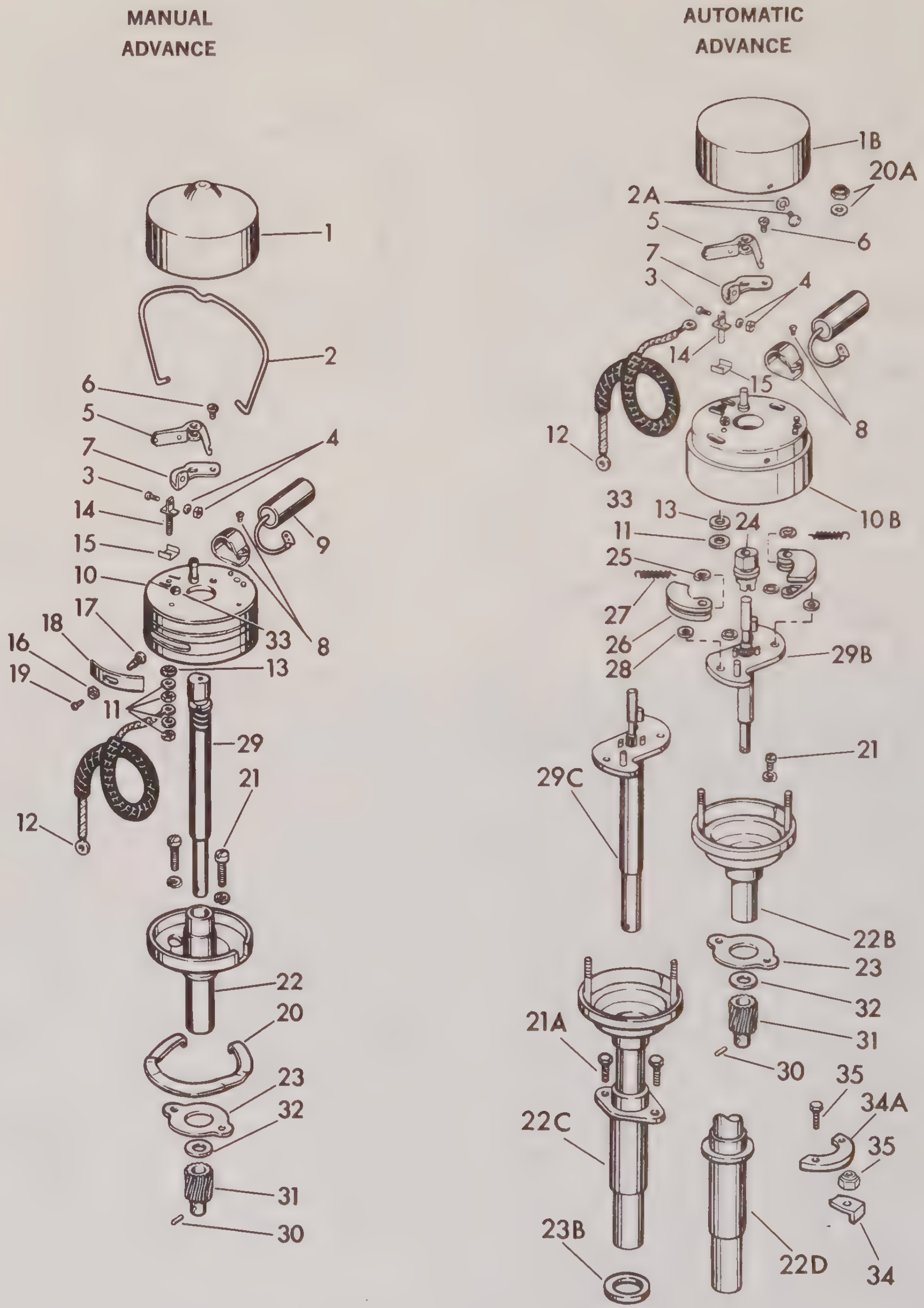
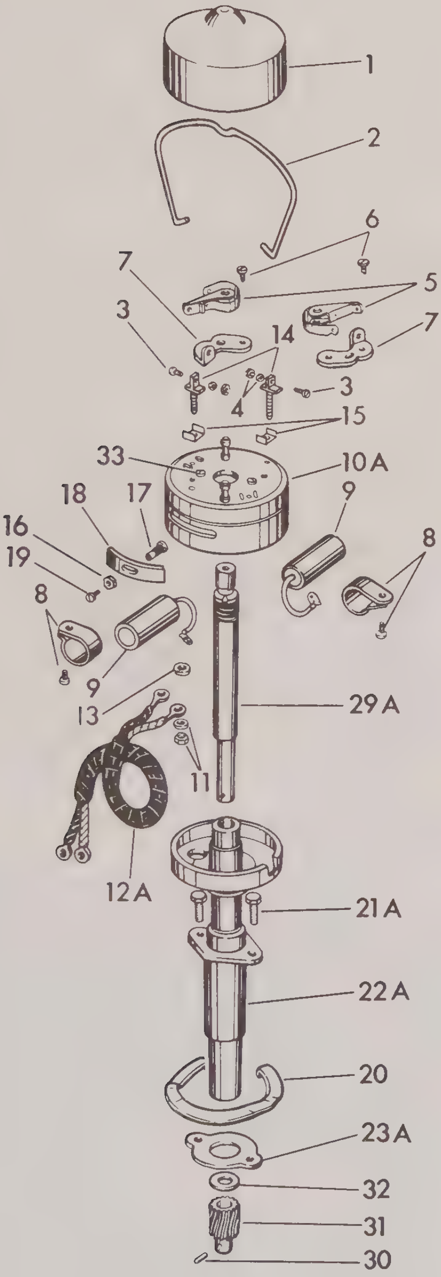

MANUAL ADVANCE
AUTOMATIC ADVANCE
1B
2A
10 B

CIRCUIT BREAKERS (1969 AND EARLIER)

DOUBLE CONTACT



1. Cover
1B. Cover
2. Cover retainer
2A. Cover screw and lockwasher
3. Wire stud screw
4. Wire stud nut and lockwasher
5. Contact point lever
6. Adjustable point locking screw
7. Contact point and support
8. Condenser bracket and screw
9. Condenser
10. Base
10A. Base
10B. Base
11. Stud nuts and washers
12. Cable
12A. Cable
13. Wire stud fiber washer
14. Wire stud
15. Wire stud insulator
16. Adjusting stud locknut
17. Adjusting stud
18. Adjusting stud plate
19. Control wire lockscrew
20. Base retainer
20A. Base nut and washer
21. Crankcase screw
21A. Crankcase screw
22. Stem
22A. Stem
22B. Stem
22C. Stem
23. Gasket or O ring
23A. Gasket or O-ring
23B. Gasket or O-ring
24. Cam
25. Clip
26. Flyweight
27. Flyweight spring
28. Washer
29. Camshaft
29A. Camshaft
29B. Camshaft
29C. Camshaft
30. Gear pin
31. Gear
32. Shaft washer
33. Eccentric screw
34. Stem clamp
34A. Stem clamp
35. Clamp nut or bolts

3. Telescope front cylinder intake valve pushrod cover (closest to carburetor) so that pushrod operation can be observed.

4. Turn engine in its normal running direction until front piston is on its compression stroke, then continue turning slowly until timing mark is centered in timing inspection hole (Figure 9). The cylinder is on its compression stroke just after its intake valve closes.

5. Install new rubber seal (23B).

6. Insert shaft and stem assembly into gearcase cover, making sure that cable is inserted into hole of stem flange. Position stem so that timing marks on base (Figure 10) face away from engine. Before engaging drive gear, turn shaft counterclockwise approximately 60 degrees from position where mark on cam aligns with fiber rubbing block on movable breaker contact.

7. Install both crankcase screws snugly, but do not tighten them.

8. Observe how closely mark on cam aligns with rubbing block. If it does not align closely, lift shaft and stem assembly from gearcase. Turn shaft gear one tooth, then again check alignment. Repeat until cam mark aligns closely with rubbing block.

9. Tighten both crankcase screws.

10. Position base assembly on shaft so that timing marks align, then tighten nuts.

11. Adjust ignition timing. Refer to Chapter Two for procedure.

Installation (1966-1969 Models)

1. Remove spark plugs.

2. Remove timing inspection plug.

3. Telescope front cylinder intake valve pushrod cover (closest to carburetor).

4. Turn engine in its normal running direction until front piston is on its compression stroke, then continue turning slowly until timing mark on flywheel is centered in inspection hole (Figure 9). The cylinder is on its compression stroke just after its intake valve closes.

5. Install new rubber seal.

6. Turn shaft gear so that cam mark aligns with fiber rubbing block on movable breaker contact (Figure 11).

7. Insert circuit breaker into gearcase cover with cable toward rear of engine.

8. Observe how closely mark on cam aligns with fiber rubbing block. If it does not align, lift circuit breaker assembly from gearcase. Turn shaft gear one tooth, then again check alignment. Repeat until cam mark aligns closely with the rubbing block.

9. Install stem clamp, then tighten clamp bolt.

10. Adjust ignition timing. Refer to Chapter Two for procedure.

Removal and Installation (1970 and Later Models)

Figure 12 is an exploded view of a typical circuit breaker on these models. Refer to that illustration during service.

1. Remove circuit breaker cover and gasket.

2. Remove wire and terminal (4) from breaker contact terminal post.

3. Remove breaker plate (**Figure 13**) after removing its retaining screws or retainer.

4. Remove cam bolt (**Figure 14**).

5. Remove breaker cam (**Figure 15**).

6. Remove centrifugal advance mechanism (**Figure 16**).

7. Reverse Steps 1 through 6 to install.

Circuit Breaker Inspection

Disassemble circuit breaker and inspect all parts for wear or deterioration. On models so equipped, check advance mechanisms for free operation. Be sure that springs are not stretched or distorted. Be sure that the wire which goes from circuit breaker to coil is in good condition.

Check breaker points for pitting or burning. Replace them in case of doubt. Refer to Chapter Two for procedure.

Condenser

The condenser is a sealed unit that requires no maintenance. Be sure that both connections are clean and tight.

In the event that no test equipment is available, a quick test of the condenser may be made by connecting the condenser case to the negative terminal of a 12-volt battery, and the positive

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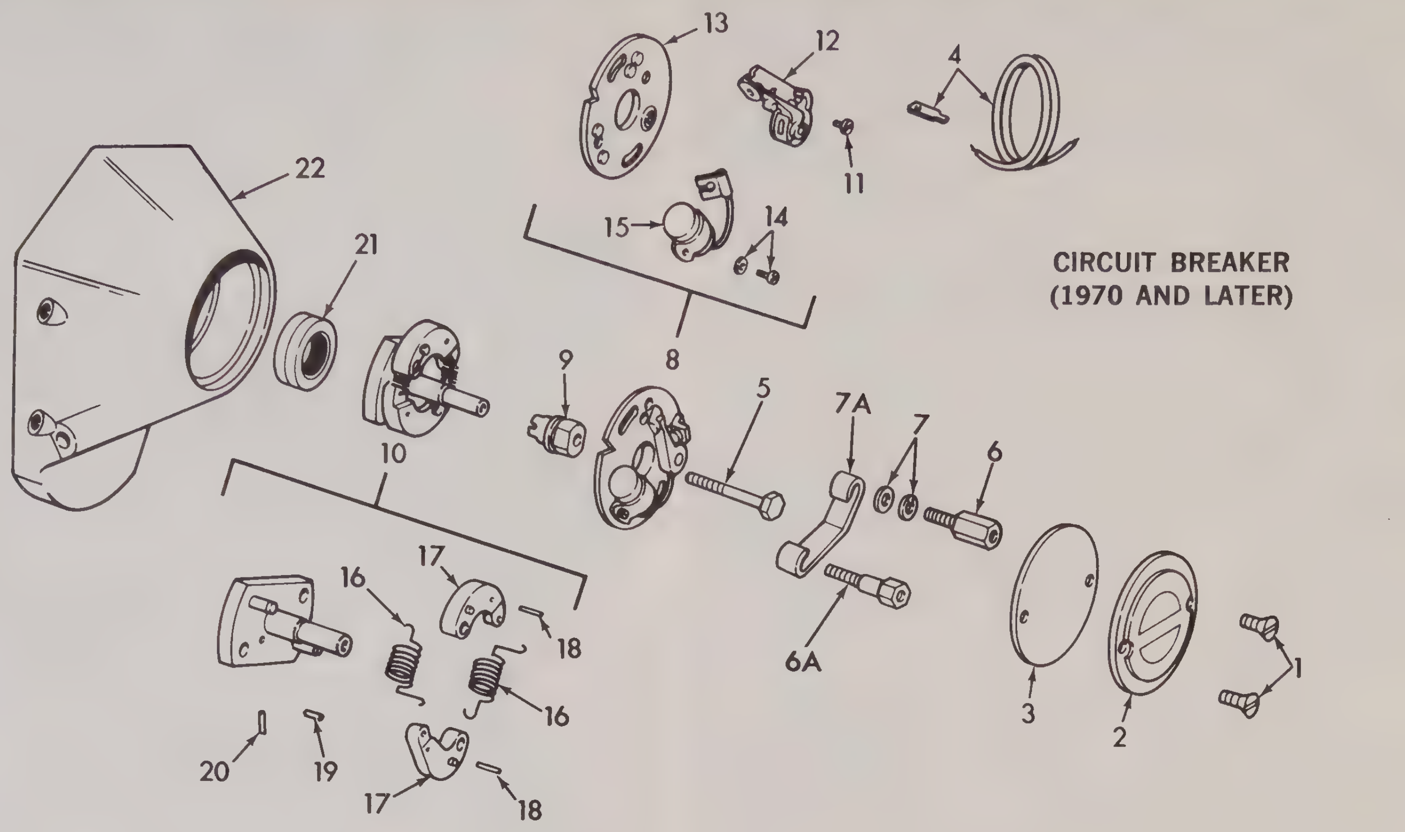
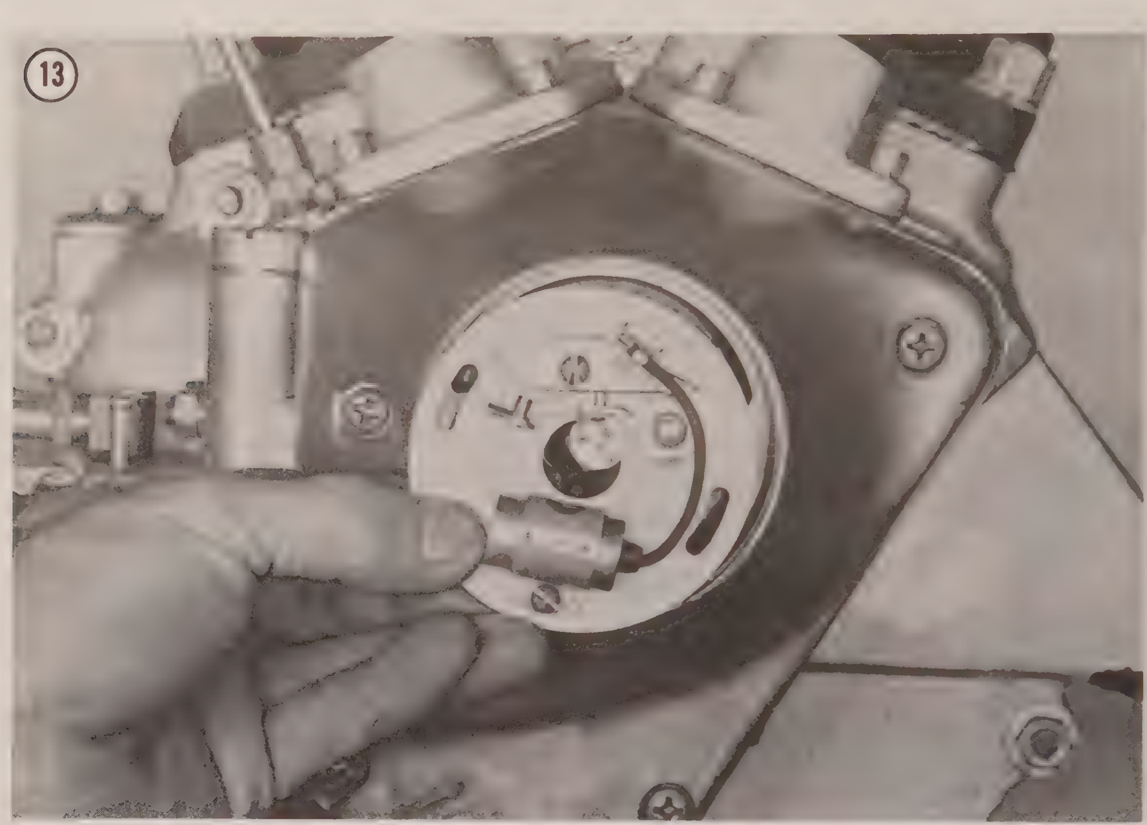


CIRCUIT BREAKER
(1970 AND LATER)

1. Circuit breaker cover screws
2. Circuit breaker cover
3. Circuit breaker cover gasket
4. Wire terminal and wire
5. Circuit breaker cam bolt
6. Breaker plate screw (1970)
6A. Breaker plate screw (1971 and later)
7. Breaker plate screw lockwasher and washer
7A. Retainer (1971 and later)
8. Breaker plate assembly
9. Breaker cam
10. Advance assembly
11. Breaker contact screw
12. Breaker contact assembly
13. Breaker plate
14. Condenser screw and lockwasher
15. Condenser
16. Flyweight spring
17. Flyweight
18. Flyweight roll pin
19. Cam stop roll pin
20. Register roll pin
21. Camshaft seal
22. Gearcase cover

13



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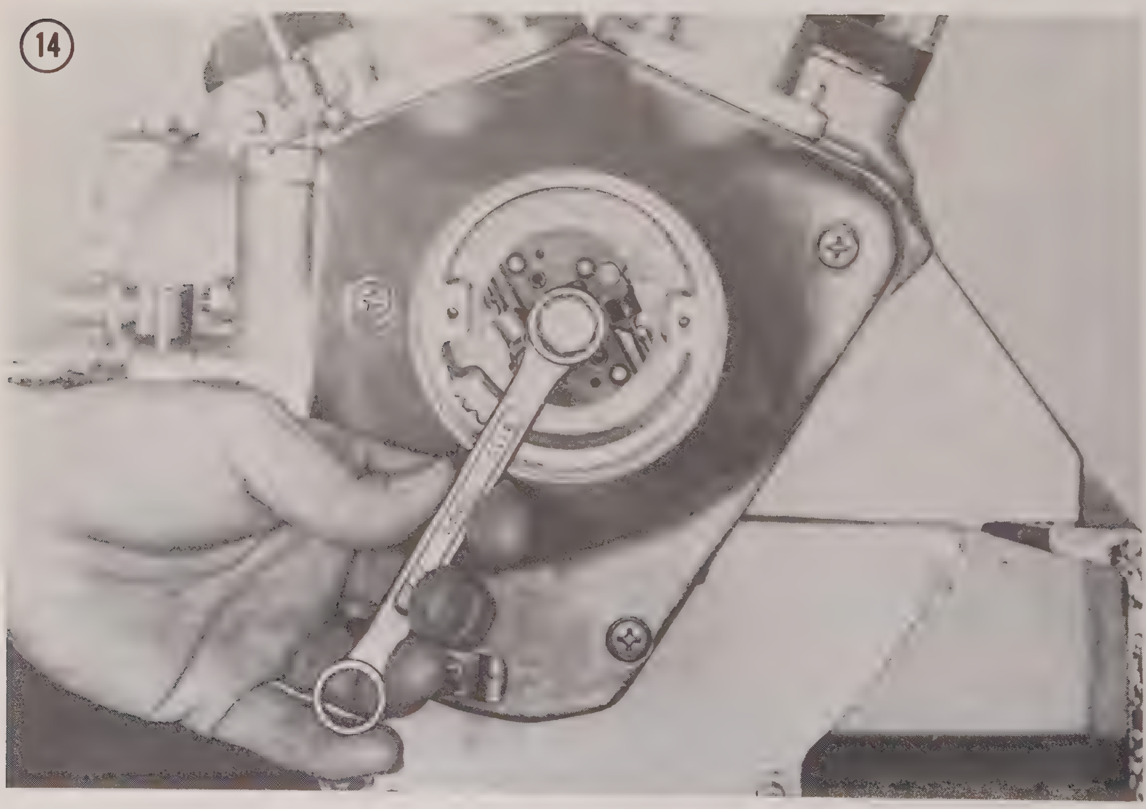

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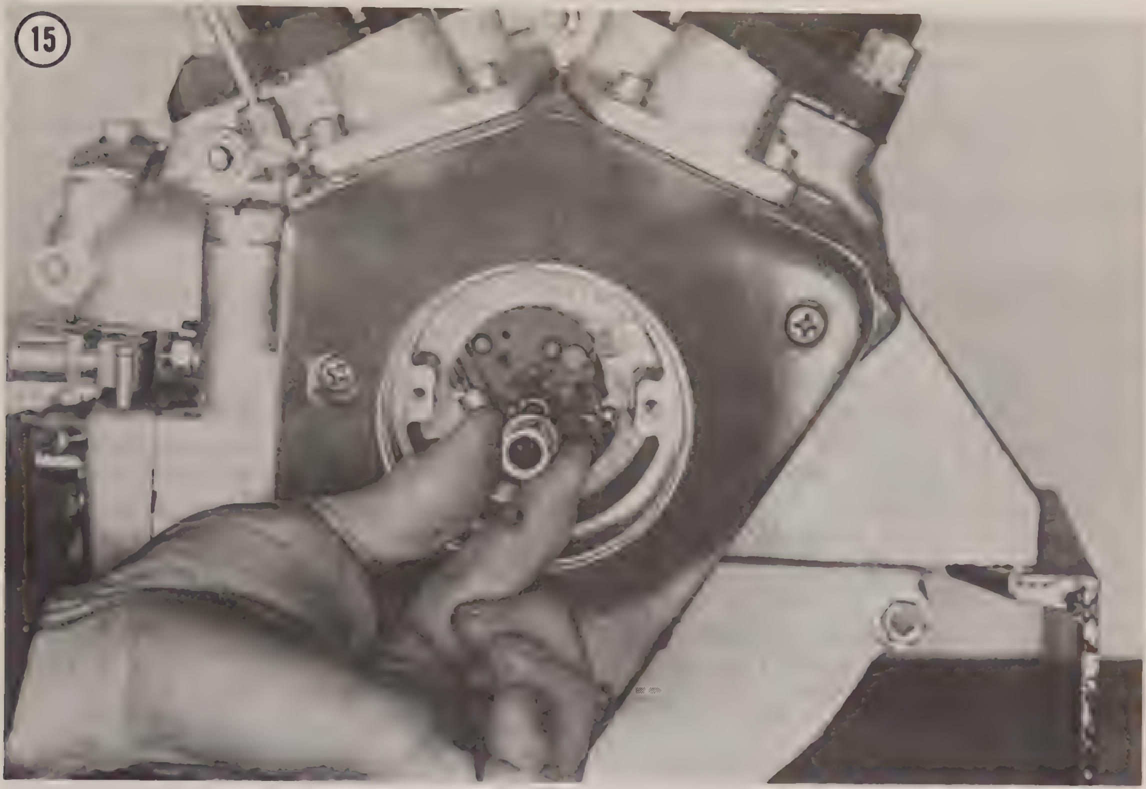

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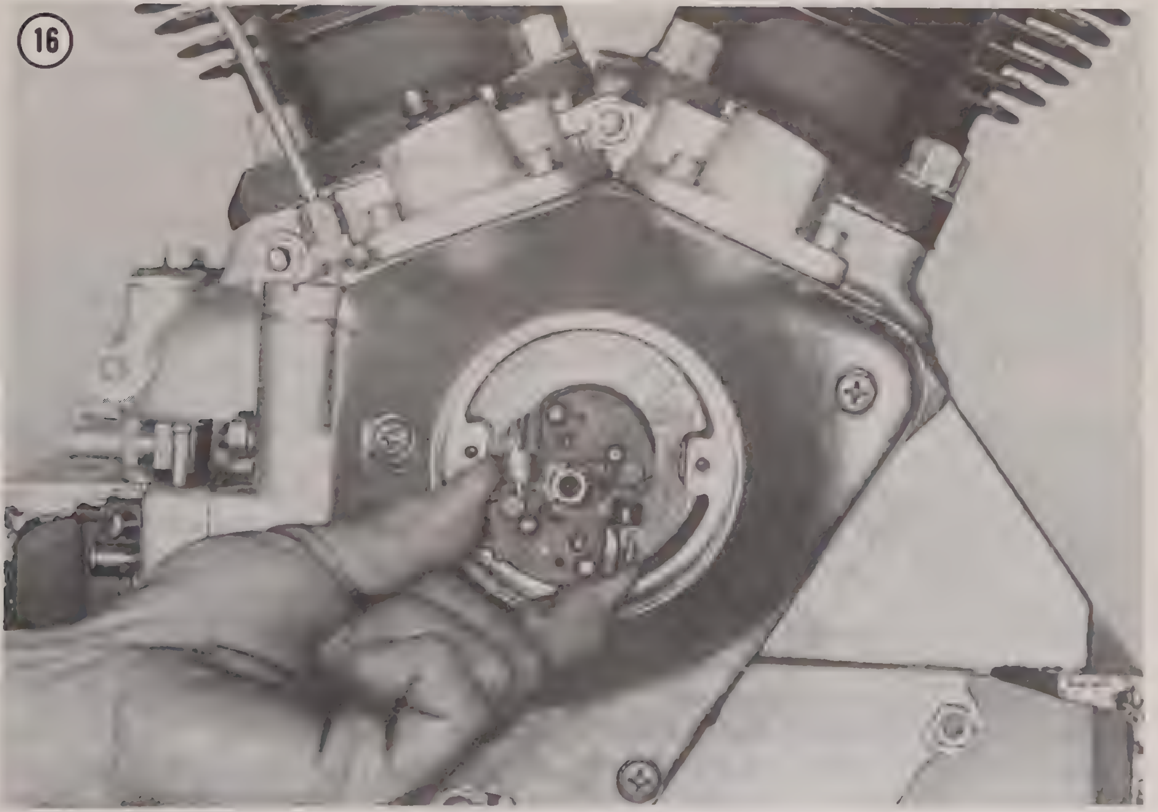


lead to the positive battery terminal. Allow the condenser to charge for a few seconds, then quickly disconnect the battery and touch the condenser pigtail to the condenser case. If you observe a spark as the pigtail touches the case, you may assume that the condenser is OK.

If the condenser is open, excessive sparking can be noticed when breaker points open. No spark will be seen if the condenser is shorted.

Breaker Points

Breaker points that are pitted or burned should be replaced. If pitting is minor, they may be dressed with a fine point file. Do not attempt to remove all roughness; it is only necessary to remove dirt or scale. If a few file strokes don't clean up points, replace them.

Measure contact pressure with a spring gauge, if one is available. Contact pressure should be 14 to 18 oz. Greater pressure will result in rapid rubbing block wear; less may cause missing at high speeds.

Be sure that breaker contacts meet squarely. Replace them if they do not.

Always adjust ignition timing after any service operation on breaker points. Refer to Chapter Two for procedure.

DC GENERATOR

Earlier models are equipped with DC generators and voltage regulators similar to those in automobiles. Service procedures are also similar. Generator problems can be classified as no charging, low charging, or overcharging.

Troubleshooting

If the problem is a generator indicator lamp which glows constantly, the problem may be a shorted lamp circuit. With the engine off, remove the wire or wires from generator (A) terminal, then turn ignition ON. If signal light now glows, wiring between it and generator is shorted.

Some models have a fuse in the generator field circuit. This fuse is located at the regulator. Be sure that it is not blown. Be sure that fuse insulator is in good condition when replacing the fuse.

To test generator output, proceed as follows.

1. With engine not running, disconnect wire from (F) terminal of generator.
2. Connect a jumper wire from (F) terminal of the generator to a good ground on the motorcycle engine.
3. Remove wire or wires from (A) terminal on generator.
4. Connect the positive terminal of a 0-30 DC ammeter to generator (A) terminal.
5. Start engine and run it at about 2,000 rpm (equivalent to about 40 mph).
6. Momentarily connect negative terminal of ammeter to positive terminal of battery. If ammeter indicates 15 amperes or more for a 6-volt system, or 10 amperes or more for a 12-volt system, generator is OK, and any problem is in the regulator or wiring.

CAUTION

Do not run engine with generator field grounded any longer than necessary. Do not run engine with no load on generator (ammeter negative lead not connected to battery) any longer than necessary. Be sure to disconnect ammeter from battery before stopping engine. Always polarize generator after servicing it or its regulator, or after disconnecting any charging system wiring.

Polarizing Generator

After any charging system wiring or component has been disconnected, the generator must be polarized before starting the engine. Failure to polarize the generator may result in burned or stuck voltage regulator contacts and possible damage to the wiring and the generator windings.

After all wiring is connected, momentarily connect a heavy jumper wire between BAT and GEN terminals on the regulator. Be sure that the battery is in good condition when performing this procedure.

Generator Removal and Installation

1. Disconnect wires from (F) and (A) terminals on generator.

2. Remove long screws that secure generator to gearcase.
3. Move generator toward left side of motorcycle, then remove it between frame members, gear end first.
4. Reverse Steps 1 through 3 for installation. Be sure to polarize generator after installation.

Generator Disassembly

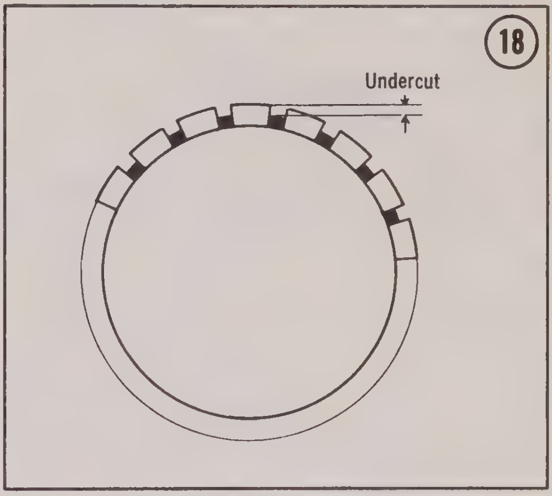
Figure 17 is an exploded view of a typical generator. Refer to that illustration during service.

1. Remove gear shaft nut and washer.
2. Using a suitable puller, remove drive gear.
3. Remove oil deflector.
4. Remove brush cover strap.
5. Remove commutator and cover nuts and washers.
6. Remove frame screws and washers.
7. Remove commutator end cover. It may be necessary to tap it lightly with a plastic mallet to free it.
8. Free positive brush cable and brush leads by removing terminal nuts and washers.
9. Remove brush holder mounting plate.
10. Press bearing from armature.
11. Remove all terminal hardware and positive brush cable.
12. Tap drive end plate from frame.
13. Remove bearing retainer.
14. Press the armature bearing from the drive end plate.
15. Remove bearing retainer.
16. Press out drive end plate oil seal from drive gear side.

Inspection

1. Clean all parts in solvent, except for field coils, gasket, brushes, and armature.
2. Inspect all parts for wear. Pay particular attention to insulators, armature windings, pole shoes, and coils.
3. Replace the oil seal if there is any evidence of oil on the armature.
4. Replace ball bearings in the event of looseness. Be sure to pack new or used bearings with grease.
5. If any brush holder component is bent, replace it.
6. Replace brushes if they are so worn that the longest side measures ½ in. or less.
7. Check field coils for open or short circuits. Replace field coils if necessary.
8. Using an ohmmeter or armature growler, check for opens or shorts in the armature.
9. Turn down the commutator if it is burned or rough. Any small motor shop can perform this operation. Be sure to undercut each mica segment between commutators to a depth of 0.025 in. (**Figure 18**).

⑱



Generator Reassembly

1. Assemble all brush holder mounting plate components.
2. Place bearing retainer in inner groove of drive end plate, then press in bearing until it seats on retainer. Compress bearing retainer, then secure it in outer groove of drive end plate.
3. Press the oil seal into drive end plate from the back side.
4. Press in armature drive end shaft until its shoulder seals.
5. Assemble terminal field coil lead, positive brush cable, terminal screw bushing, bolt clip, terminal insulator, and terminal screw. Then insert assembled (A) terminal from inside and

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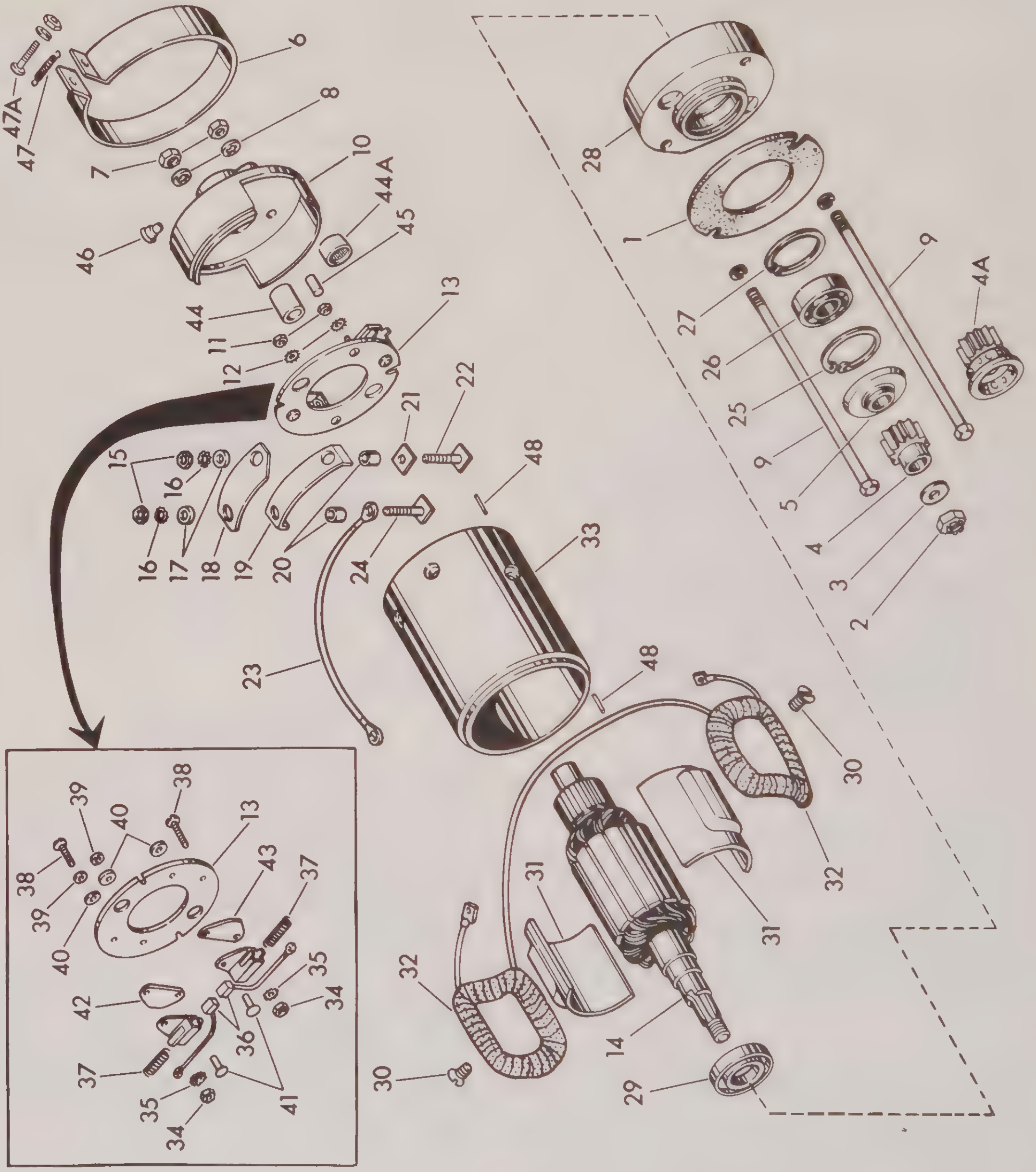
4A

GENERATOR

1. Mounting gasket
2. Gear shaft nut
3. Gear shaft washer
4. Drive gear
4A. Drive gear with oil slinger
5. Drive end oil deflector
6. Brush cover strap
7. Commutator end cover nut
8. Commutator end cover washer
9. Frame screw
10. Commutator end cover
11. Brush cable nut
12. Brush cable washer
13. Brush holder mounting plate
14. Armature
15. Terminal screw nut
16. Terminal screw lockwasher
17. Insualting washer
18. Terminal insulator
19. Terminal bolt clip
20. Terminal screw bushing
21. Bracket insulator
22. Terminal screw
23. Positive brush cable
24. Terminal screw
25. Bearing retainer
26. Armature bearing
27. Bearing retainer
28. Drive end plate
29. Armature oil seal
30. Pole shoe screw
31. Pole shoe
32. Field coil
33. Frame
34. Terminal screw nut
35. Terminal screw lockwasher
36. Brush
37. Brush spring
38. Brush holder plate screw
39. Brush holder plate screw washer
40. Brush holder plate screw washer
41. Brush holder plate rivet
42. Brush holder insulation
43. Brush holder spacer
44. End cover bushing
44A. End cover bearing
45. Generator oil wick
46. Commutator end cover oil cup
47. Brush cover strap spring
47A. Brush cover screw, lockwasher,and nut (1966 model)
48. End locating pin

secure it with its insulating washer, lockwasher, and nut.

6. Assemble (F) terminal and insert it from the inside.

7. Install generator frame, taking care that locating pin engages its hole in drive end plate.

8. Lead unconnected end of positive brush cable out of commutator end of generator.

9. Install brush mounting plate assembly. To do so, first push brushes back in their holders to clear commutator. Be sure that locating pin engages small slot and brush cable passes through large slot.

10. Connect positive brush lead to positive brush terminal. Connect negative brush to its terminal.

11. Install commutator end cover. Be sure that its notch engages locating pin on frame end.

12. Install the commutator end internal lockwashers on frame screws, then insert them from drive end. Install frame screw nuts and lockwashers.

13. Check that armature turns without binding. Armature shaft will not turn freely, but there should be no tight spots.

14. Assemble drive end oil deflector, drive gear, washer, and nut. Tighten nut until drive gear seats against oil deflector.

15. Install brush cover strap.

16. Mount generator, using a new gasket. Always use gasket cement when installing generator. Be sure that all traces of old gasket and gasket cement are removed from mating surfaces.

VOLTAGE REGULATOR

Harley-Davidson motorcycles with DC generators are equipped with Delco-Remy voltage regulators. Testing and adjustment of voltage regulators is a job best left to specialists, but for those who have the necessary skills and equipment, the following procedures are set forth.

There are 4 basic regulator tests to be performed.

a. Generating system test, which determines whether the generator or regulator is faulty.

b. Cutout relay closing voltage.

c. Voltage regulator setting.

d. Current regulating setting.

Before any regulator testing, operate the motorcycle for at least 15 minutes so that the regulator is at normal operating temperature. Regulator cover and gasket must be in place.

Generating System Test

With the motorcycle not running, refer to **Figure 19**, then proceed as follows.

1. Disconnect the wire which goes to the battery at regulator BAT terminal. Connect this wire to the negative terminal of a 0-30 DC ammeter. Connect the positive ammeter terminal to BAT terminal on regulator.
2. Connect the positive terminal of an accurate 0-20 DC voltmeter to regulator GEN terminal. Connect the negative voltmeter terminal to a good ground.
3. Disconnect the wire from regulator (F) terminal. Connect the wire which was removed to one terminal of a field control rheostat. Connect the other rheostat terminal to a good ground. Set field control rheostat to OPEN position.
4. Start engine and run it at approximately 2,000 rpm (40 mph road speed).
5. Slowly turn field control rheostat toward DIRECT position until ammeter indicates 15 amperes (6-volt systems) or 10 amperes (12-volt systems). If generator output is as specified, difficulty is in regulator. If there is no ammeter indication, or if indication is low, observe voltmeter. If voltmeter indicates 6V or less on 6-volt systems, or 12V or less on 12-volt systems, generator requires repairs. If ammeter indication was low but voltmeter indication was 7.5V or more (6-volt system) or 15V (12-volt system), cutout relay in voltage regulator unit is defective.

Cutout Relay Closing Voltage

With the engine not running, make the same test connections as specified in *Charging System Test*. The test setup is the same as that shown in Figure 19. Then proceed as follows.

1. Turn field control rheostat to OPEN position.
2. Start engine and run it at approximately 1,500 rpm (30 mph road speed).

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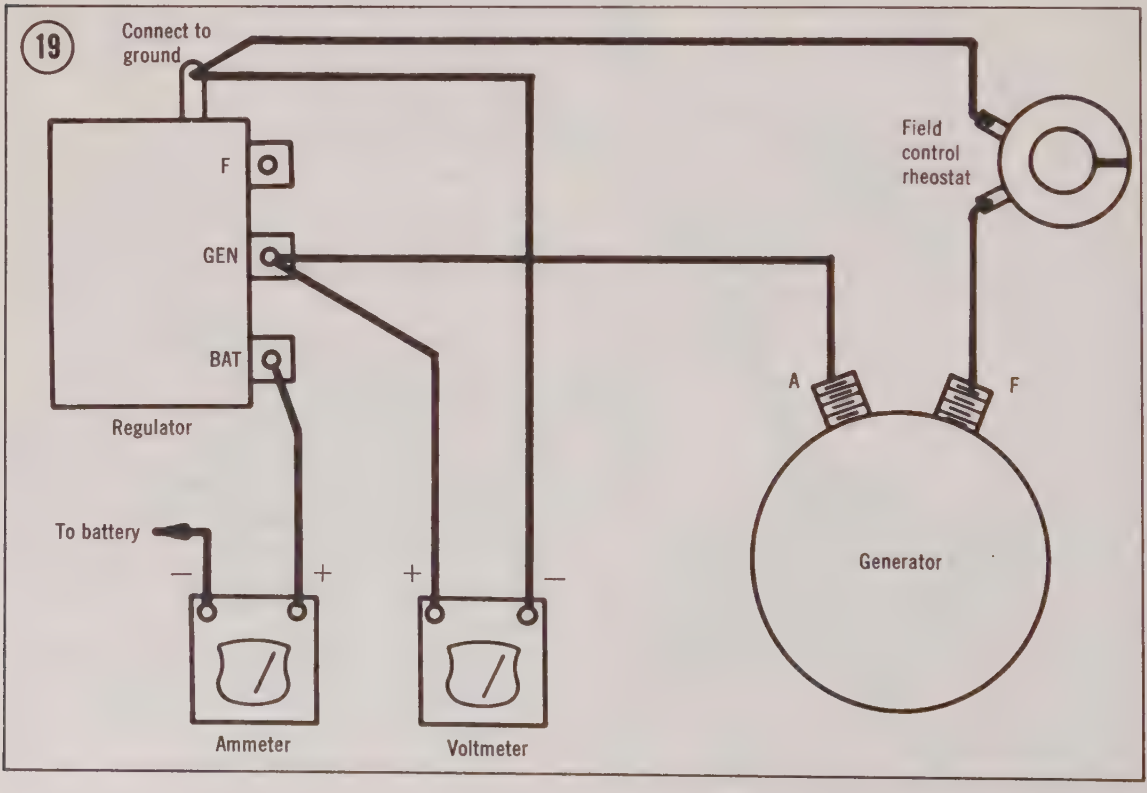

3. Slowly turn field control rheostat toward DIRECT position; observe voltmeter indication; it will increase slowly, then "kick" suddenly. Cutout relay closing voltage is that indicated on voltmeter just before it "kicks". Cutout relay closing voltage should be 5.9 to 6.7V for 6-volt systems, or 11.8 to 13.0V for 12-volt systems. If cutout relay closing voltage is not within specifications, replace or adjust.

Voltage Regulator Setting

With the motorcycle not running, refer to **Figure 20**, then proceed as follows.

1. Disconnect wire to battery at voltage regulator BAT terminal. Connect the other resistor terminal to voltage regulator BAT terminal.
2. Connect the positive terminal of an accurate 0-20 DC voltmeter to voltage regulator BAT terminal. Connect the negative voltmeter terminal to a good ground.
3. Disconnect generator field wire from voltage regulator (F) terminal. Connect one terminal of a field rheostat to the field wire which was disconnected. Connect the other field control rheostat terminal to voltage regulator (F) terminal. Turn field control rheostat control to DIRECT.
4. On models with 6-volt systems, start engine, then run it at approximately 2,000 rpm (40 mph road speed). Turn field control rheostat to OPEN, then to DIRECT position. Observe voltmeter indication. Voltmeter indication is voltage regulator setting. If regulated voltage is not as specified in **Table 2**, replace or adjust voltage regulator.
5. On models with 12-volt systems, start engine and run it at approximately 2,000 rpm (40 mph road speed). Turn field control rheostat to OPEN, then to DIRECT position. Observe voltmeter indication. Voltmeter indication is regulated voltage of upper contacts. Maintain engine speed, then slowly turn field control rheostat toward OPEN position until voltmeter indication drops slightly and stabilizes. Voltmeter indication is regulated voltage of lower contacts. Lower contact regulated voltage must be 0.1 to 0.3V less than that of upper contacts. Replace or adjust regulator if these conditions do not exist.

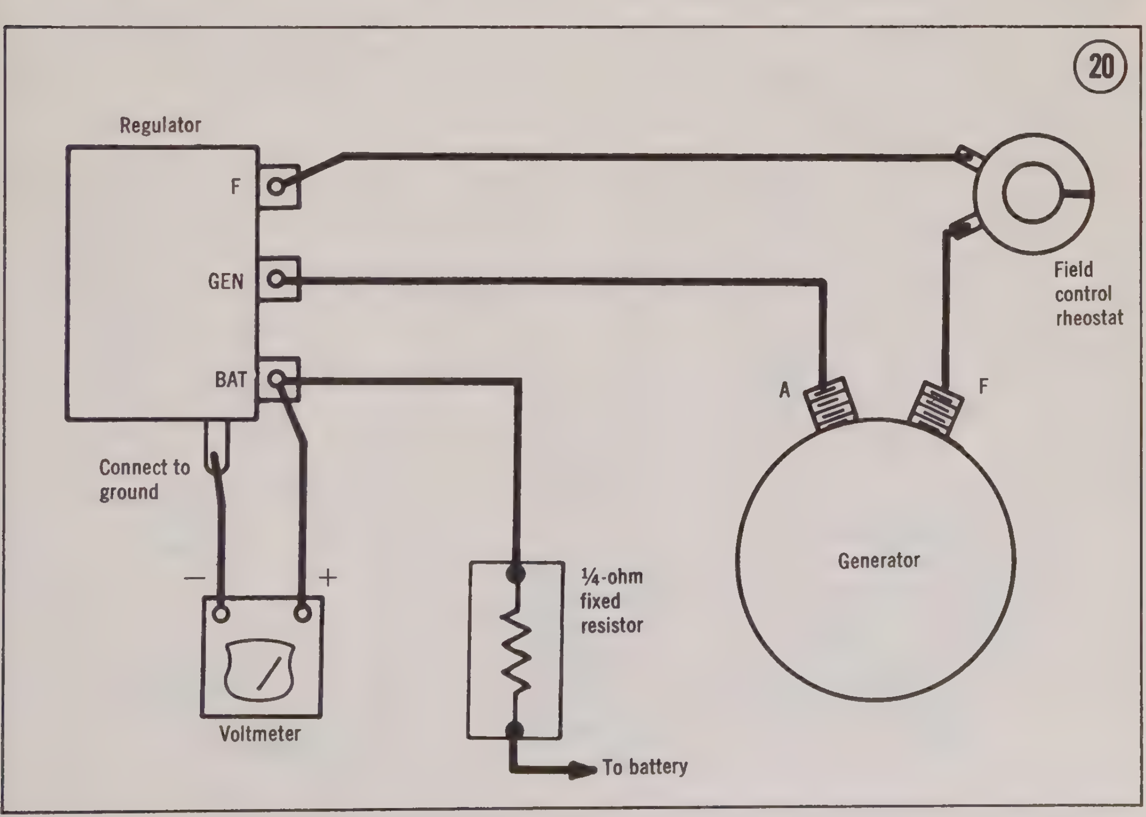

Table 2 VOLTAGE REGULATOR RANGE

Delco-Remy Part No.	Voltage Regulator Setting
1118 388	7.5
11119 187C	7.2-7.5
11119 187D	7.2-7.5
1118 307	7.0[1]
1118 307	7.4[2]
1118 794	7.0[1]
1118 794	7.4[3]
1118 995	7.0-7.3
1118 989	6.5-6.8

1. Models 125-165 generators.
2. Model 52K generator.
3. Models 58 and 61 generators.

Current Regulator Setting

This test is performed only on motorcycles with 3-unit voltage regulators. Refer to **Figure 21** for this procedure.

1. Remove wire which goes to battery from voltage regulator BAT terminal. Connect wire which was removed to the negative terminal of a 0-30 DC ammeter. Connect the positive ammeter terminal to regulator BAT terminal.
2. Connect the positive terminal of a 0-20 DC voltmeter to voltage regulator BAT terminal. Connect the negative voltmeter lead to a good ground.
3. Start engine and run it at approximately 2,000 rpm (40 mph road speed). Turn on lights and connect an additional load, such as an adjustable carbon pile, across the battery until voltmeter indicates one volt less than regulated voltage.
4. Observe ammeter indication. If not within specifications listed in **Table 3**, adjust or replace voltage regulator.

ALTERNATOR

Models from 1970 onward are equipped with alternators and solid state rectifier-regulator units. Beginning with 1976

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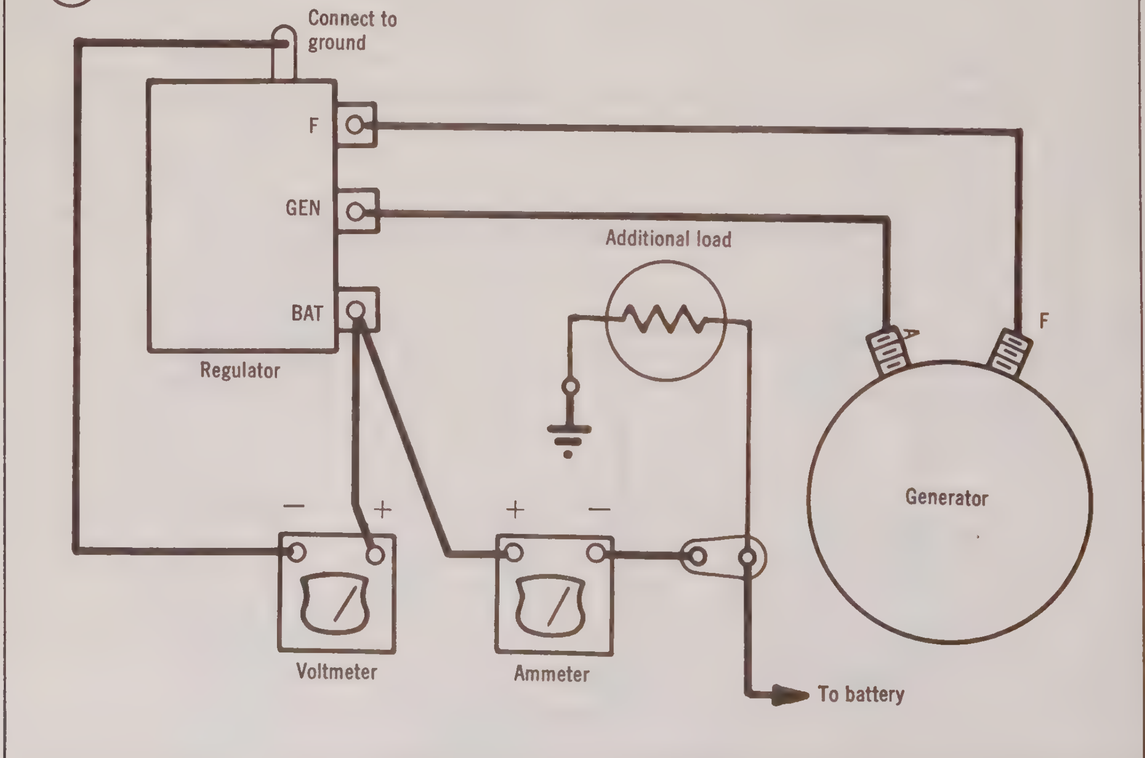


Table 3 CURRENT REGULATOR SPECIFICATIONS

Delco-Remy Part No.	Current Regulator Setting
1118 388	18 amperes
1119 187C	13.5-16.5 amperes
1119 187D	13.5-16.5 amperes
1119 614	9.0-11.0 amperes

models, a slightly different alternator was installed; refer to the supplement at the end of the book for service procedures on it and its regulator.

Harley-Davidson alternators (**Figure 22**) are simple, rugged devices, with little that can malfunction. Certain precautions must be observed, however, to prevent damage to it or its voltage regulator/rectifier.

1. Never reverse battery connections. Instantaneous damage may occur.
2. In the event that a booster battery must be connected, be sure to connect positive to positive and negative to negative.
3. Do not short across any connections.
4. Never attempt to polarize an alternator.
5. Never start engine with alternator disconnected from its voltage regulator/rectifier, unless specifically instructed to do so in testing.
6. Never start or run engine with battery disconnected.
7. Never use a high-output battery charger to assist in engine starting.
8. Never disconnect engine-to-voltage regulator plug with engine running.
9. Disconnect negative battery lead when charging battery.
10. Do not move voltage regulator/rectifier module to another location.
11. Be sure that battery negative terminal is connected to both engine and frame.

Checking Charging System (1970-1975)

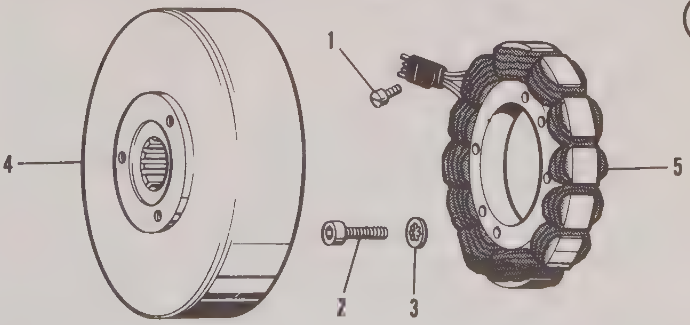
Figure 23 illustrates charging system connections. Reference to that illustration will aid in diagnosis of malfunctions. Before beginning any system tests, check that the battery is in good condition and is fully charged. Check also for loose, dirty, or corroded connections. Be sure that regulator/rectifier module has a clean, tight connection to engine crankcase.

If these preliminary checks do not correct the problem, refer to **Figure 24**, then proceed as follows.

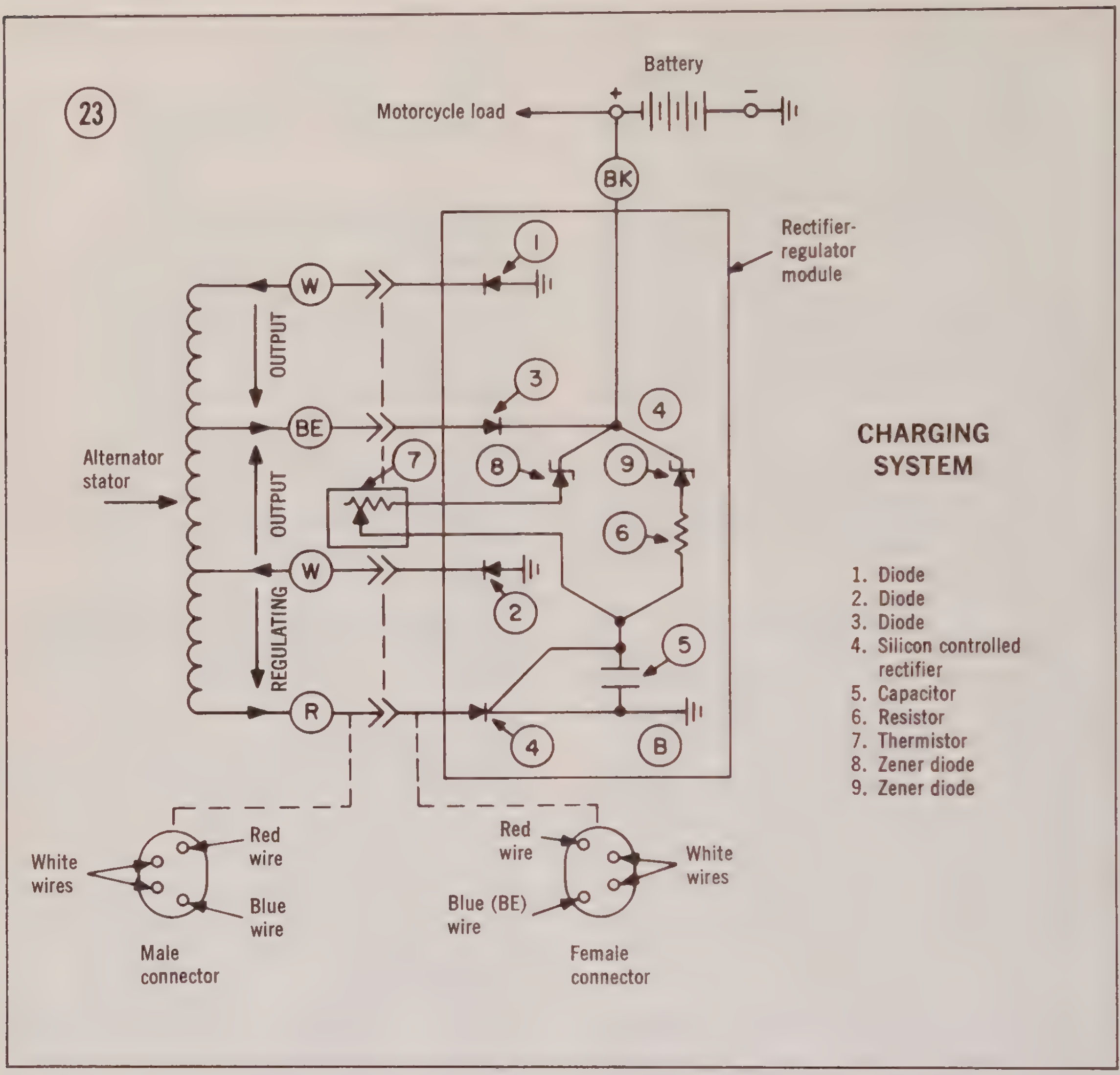
1. Start engine and run it long enough for voltage regulator/rectifier module temperature to stabilize.
2. Shut off engine.
3. Connect a 0-20 DC ammeter in series with alternator output (blue) lead, between battery and regulator/rectifier module.
4. Connect a carbon pile load or rheostat and an accurate 0-20 DC voltmeter across battery. Carbon pile or rheostat must be in OFF position.
5. Start engine, and run it at 3,600 rpm.
6. With a fully charged battery, and module temperature stabilized, voltmeter must indicate 13.8 to 15.0V, depending on ambient temperature. Ammeter should indicate approximately 3.5 amperes. Output voltage will vary with ambient temperature, and should be within limits shown in **Figure 25**.

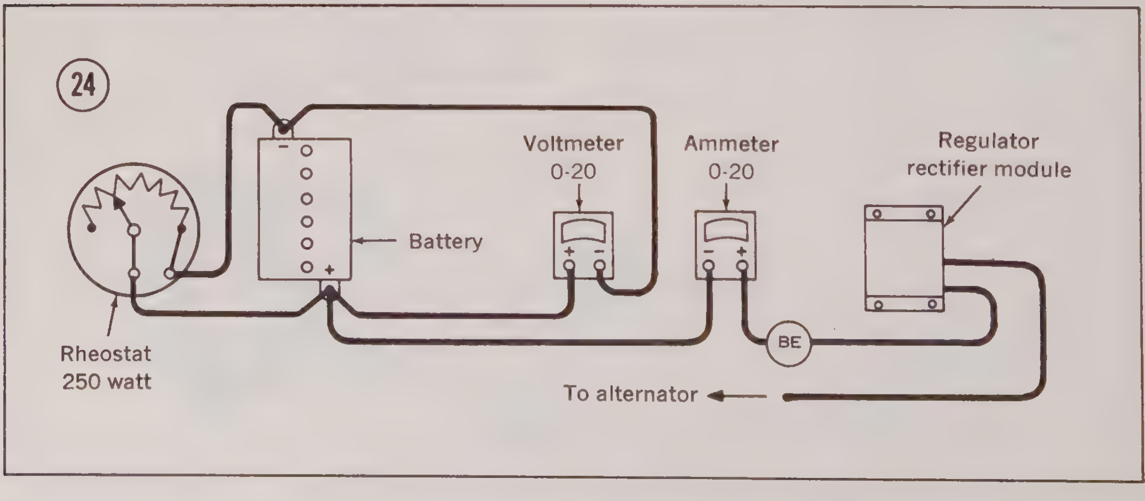
(22)

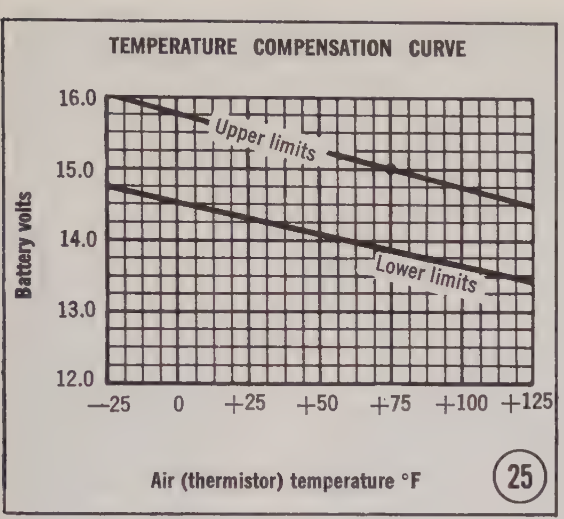
ALTERNATOR (TYPICAL)



1. Screw
2. Screw
3. Lockwasher
4. Rotor assembly
5. Stator


23
Battery
Motorcycle load
BK
Rectifier-regulator module
W
BE
W
R
OUTPUT
OUTPUT
REGULATING
Alternator stator
1
2
3
4
4
5
6
7
8
9
B
Red wire
Blue wire
White wires
Male connector
Red wire
Blue (BE) wire
White wires
Female connector
CHARGING SYSTEM
1. Diode
2. Diode
3. Diode
4. Silicon controlled rectifier
5. Capacitor
6. Resistor
7. Thermistor
8. Zener diode
9. Zener diode


24
Voltmeter 0-20
Ammeter 0-20
Regulator rectifier module
Battery
Rheostat 250 watt
BE
To alternator



25

7. Slow engine to 2,000 rpm. Adjust carbon pile or load rheostat so that voltmeter indicates exactly 13.0V. Ammeter must indicate at least 10.5 amperes.

8. If regulated voltage obtained in Step 6 was OK, but output current in Step 7 was less than 10.5 amperes, continue with Steps 9 through 12.

9. Stop engine, then disconnect voltage regulator/rectifier module plug.

10. Check voltage regulator/rectifier with an ohmmeter. **Table 4** lists test connections. Note that for many ohmmeters, test current polarity is opposite to test lead color; that is, the red lead is negative.

Table 4 MODULE RESISTANCE CHECKS

Positive Connection	Negative Connection	Indication
First white wire	Module base	Infinity
Module base	First white wire	3-15 ohms
Second white wire	Module base	Infinity
Module base	Second white wire	3-15 ohms
Blue	Black	3-15 ohms
Black	Blue	Infinity
Red	Module base	Infinity
Module base	Red	Infinity

Replace voltage regulator/rectifier module if it fails any of the foregoing resistance checks.

11. Check alternator stator with a low-reading ohmmeter. **Table 5** lists connections. Meter polarity is not involved in these checks.

Table 5 STATOR RESISTANCE CHECKS

Meter Connections	Resistance
White - White	0.3 to 1.0 ohm
1st White - Blue	Both meter indications must be the same
2nd White - Blue	
Red - Blue	1.5 to 2.0 ohms
Any lead - Ground	Infinity

12. If the foregoing stator resistance checks are inconclusive, make the following stator output voltage test. Note that during this test, engine is operated with voltage regulator/rectifier module disconnected.

a. Connect a 0-150 AC voltmeter between both white wire terminals. Start engine and run it at 2,000 rpm. Voltmeter must indicate 50 to 100V.

b. Stop engine, then connect the same voltmeter between the blue and red terminals. Start engine and run it at 2,000 rpm. Voltmeter must indicate 75 to 125V. Replace stator if output voltages are not within specifications.

Checking Charging System (1976 and Later)

Refer to the supplement at the end of the book for testing procedures for this alternator and regulator.

Alternator Removal and Disassembly

1. Remove sprocket, primary chain, clutch, and primary chain housing.

2. Using a suitable puller, remove rotor (**Figure 26**).

CAUTION

Take care not to drop or strike rotor. Doing so may cause it to lose its magnetism. Also do not allow any iron or steel particles to become attached to it.

3. Remove 4 stator mounting screws and one plug retaining screw, then pull out stator.

4. Reverse Steps 1 through 3 to install alternator. Note that rotor must be pressed into position (**Figure 27**).

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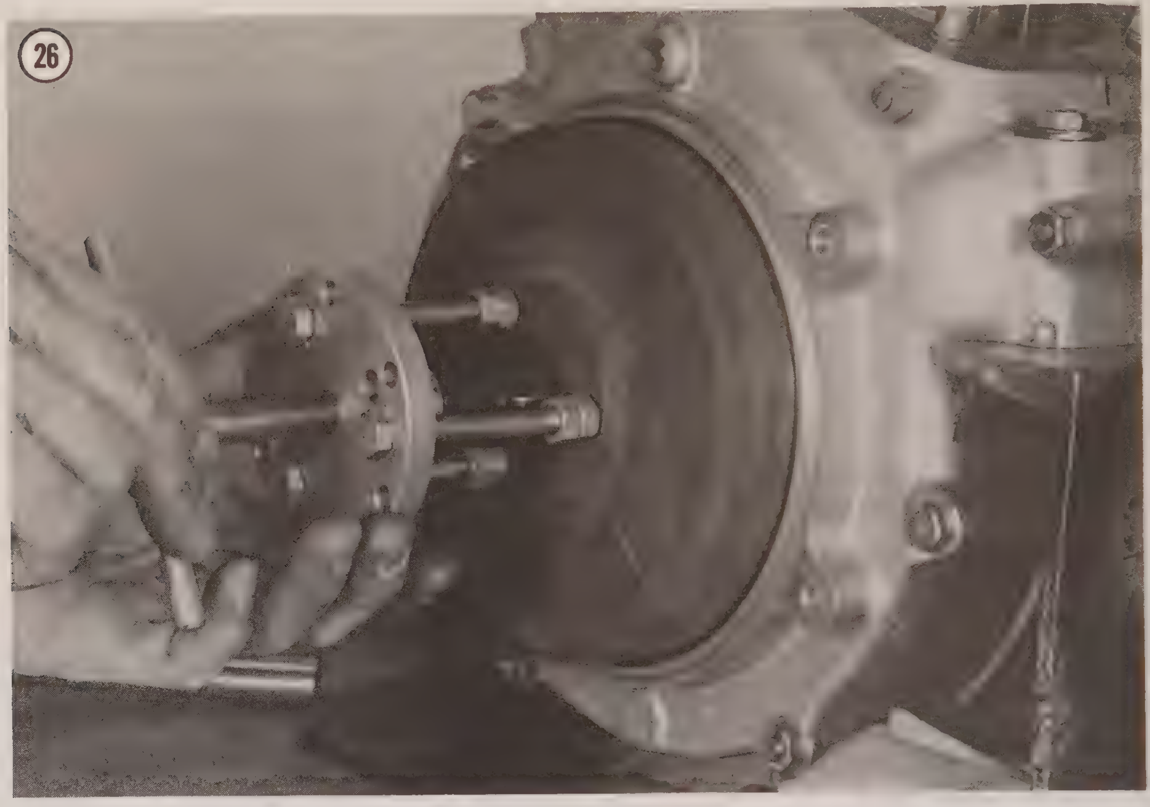
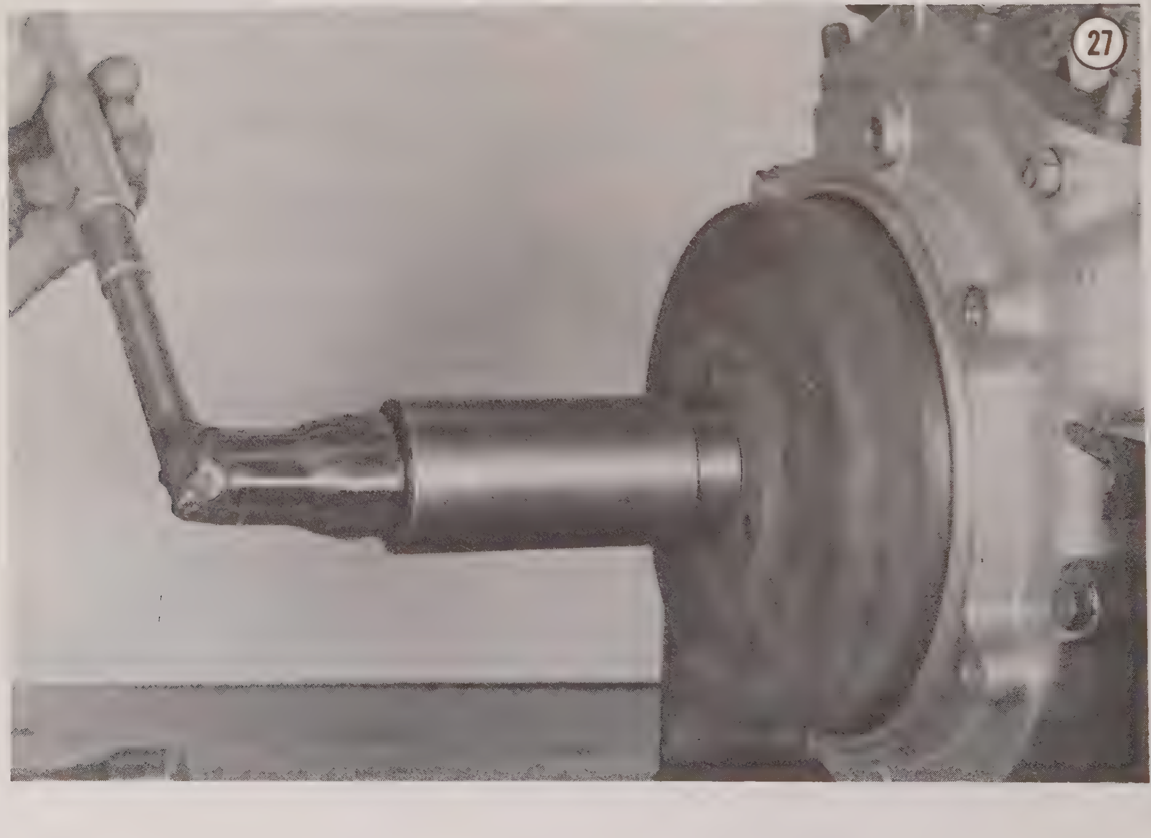


27



STARTER MOTOR

Electric starters are 4-pole, 4-brush, series-field motors which engage the clutch ring gear through a reduction gear and Bendix type drive mechanism. Battery current is supplied by a starter relay which is in turn controlled by a pushbutton on the handlebar.

Starter Troubleshooting

Before condemning the starter as defective, check that the battery is charged, and that all electrical connections are clean, tight, and free of corrosion.

On models with a neutral safety switch, be sure that the transmission is in NEUTRAL. Check each switch by bridging it with a piece of wire. When bridging the starter relay, be sure to use wire of adequate size.

If the foregoing checks prove OK, trouble is in the starter motor itself. It must then be removed for service.

Table 6 lists symptoms, probable causes, and remedies for starter malfunctions.

Starter Removal

Refer to **Figure 28** for following procedure.

1. Disconnect heavy cable at starter terminal.
2. Remove nuts and lockwashers (1).
3. Remove end support from transmission. Note that it may be necessary to loosen and raise battery carrier to provide clearance.
4. Remove starter (2) and starter shaft housing (3) as an assembly.

Starter Motor Repair

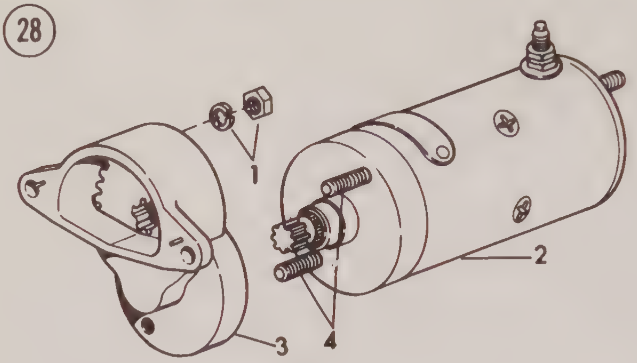
Starter motor repair is generally a job for shops specializing in such work, but some checks can be done with simple equipment. **Figures 29 and 30** are exploded views of typical Prestolite and Hitachi starter motors, respectively. Reference to the applicable illustration will make starter disassembly easier.

1. Disassemble the starter motor.
2. Remove all brushes and measure the length of each. Replace Prestolite brushes if they are worn down to ¼ in. Hitachi brushes must be replaced when they wear to 7/16 in.
3. Examine the commutator for roughness or burning. Minor roughness may be smoothed with fine sandpaper. After smoothing, be sure that the mica insulators between commutator segments are undercut to a depth of 1/32 in.
4. Use an armature growler or ohmmeter to determine that no commutator segment is shorted.

Table 6 STARTER MALFUNCTIONS

Symptom	Probable Cause	Remedy
Starter does not work	Low battery Worn brushes Internal short Open field coil Relay inoperative Defective wiring or connections Defective switch	Recharge battery Replace brushes Replace or repair defective component Replace field coil Replace relay Repair wire or clean connection Replace switch
Starter action is weak	Low battery Pitted relay contacts Brushes worn Defective wiring or connection Short in commutator	Recharge battery Replace starter relay Replace brushes Repair wire or clean and tighten connection Replace or repair armature
Starter runs continuously	Stuck relay	Replace relay
Starter turns but doesn't crank engine	Broken starter drive	Replace starter drive

28



TYPICAL STARTER

1. Attaching stud nuts and lockwashers
2. Starter motor
3. Starter shaft housing
4. Thru-bolt

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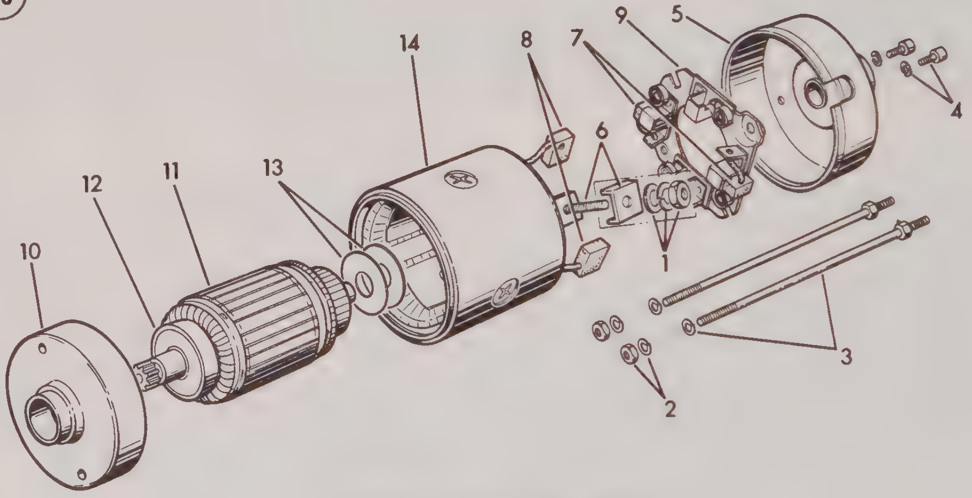
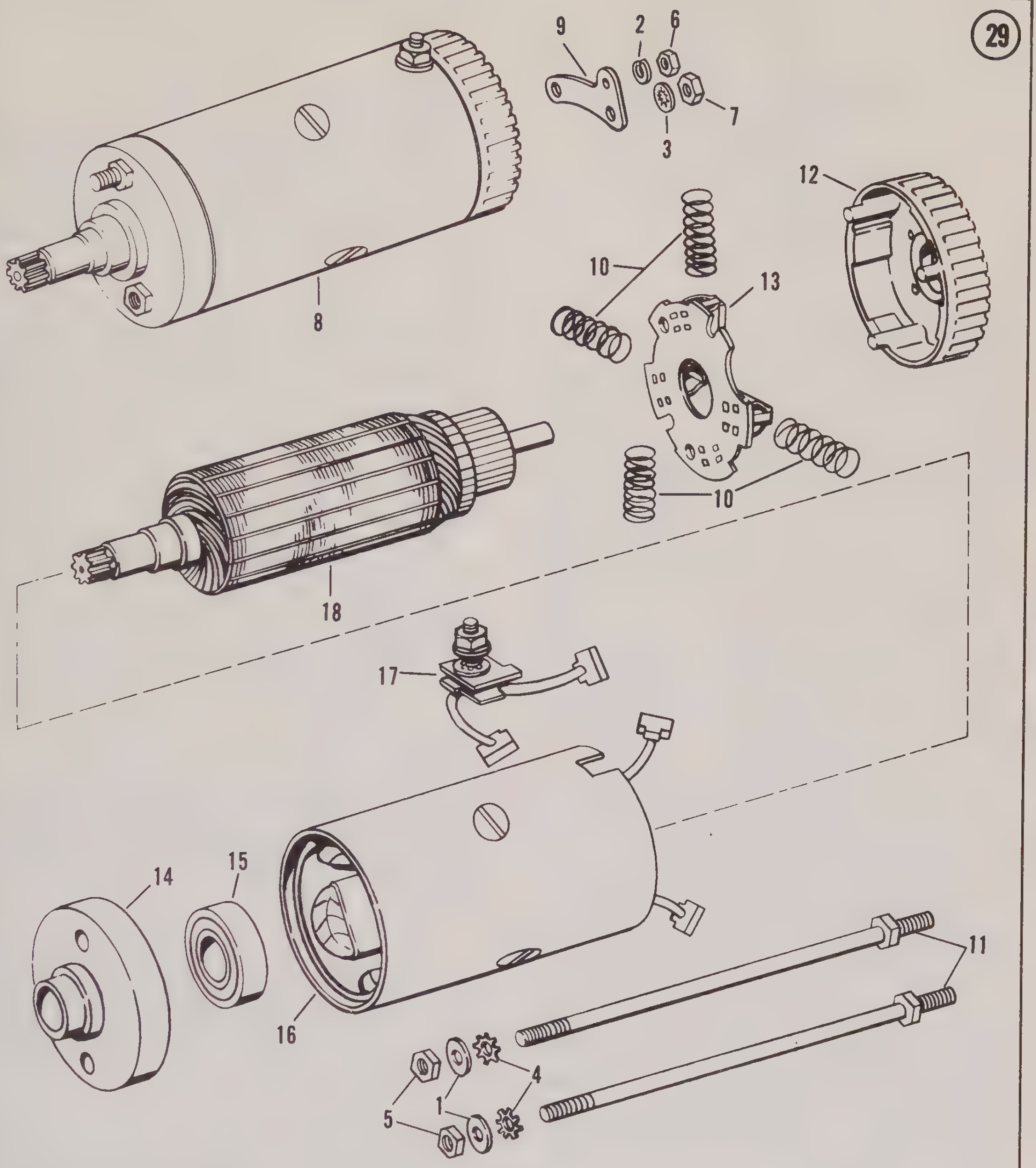


HITACHI STARTER MOTOR

1. Terminal nut, lockwasher, and washer
2. Thru-bolt nut and lockwasher
3. Thru-bolt and lockwasher
4. Rear cover screws and lockwashers
5. Rear (commutator end) cover
6. Terminal and insulator
7. Negative brush
8. Positive brush
9. Brush holder assembly
10. Front (drive end) cover
11. Armature
12. Armature ball bearing
13. Thrust washer
14. Frame

5. Using an ohmmeter, determine that there is continuity between every adjacent pair of commutator segments.

If the starter motor passes the foregoing checks, but its operation is still unsatisfactory, have it serviced professionally.



PRESTOLITE STARTER MOTOR

1. Thru-bolt washer
2. Lockwasher
3. Lockwasher
4. Thru-bolt lockwasher
5. Thru-bolt nut
6. Nut
7. Nut
8. Starter motor
9. Starter motor bracket
10. Set of brush springs
11. Set of thru-bolts
12. Commutator end cover assembly
13. Brush plate and holder assembly
14. Drive end cover assembly
15. Drive end ball bearing
16. Assembled frame and field coils
17. Terminal with set of brushes
18. Armature

BATTERY SERVICE

All models are equipped with lead-acid storage batteries, smaller in size but similar in construction to batteries used in automobiles.

WARNING

Read and thoroughly understand the section on safety precautions before doing any battery service.

Safety Precautions

When working with batteries, use extreme care to avoid spilling or splashing electrolyte. This electrolyte is sulfuric acid, which can destroy clothing and cause serious chemical burns. If any electrolyte is spilled or splashed on clothing or body, it should immediately be neutralized with a solution of baking soda and water, then flushed with plenty of clean water.

Electrolyte splashed into the eyes is extremely dangerous. Safety glasses should always be worn when working with batteries. If electrolyte is splashed into the eye, force the eye open, flood with cool clean water for about 5 minutes, and call a physician immediately.

If electrolyte is spilled or splashed onto painted or unpainted surfaces, it should be neutralized immediately with baking soda solution and then rinsed with clean water.

When batteries are being charged, highly explosive hydrogen gas forms in each cell. Some of this gas escapes through the filler openings and may form an explosive atmosphere around the battery. *This explosive atmosphere may exist for several hours.* Sparks, open flame, or a lighted cigarette can ignite this gas, causing an internal explosion and possible serious personal injury. The following precautions should be taken to prevent an explosion.

1. Do not smoke or permit any open flame near any battery being charged or which has been recently charged.
2. Do not disconnect live circuits at battery terminals, because a spark usually occurs where a live circuit is broken. Care must always be taken when connecting or disconnecting any battery charger; be sure its power switch is off before making or breaking connections. Poor connections are a common cause of electrical arcs which cause explosions.

Electrolyte Level

Battery electrolyte level should be checked weekly, particularly during hot weather. Add only distilled water when replenishment is necessary. Distilled water is available at almost every supermarket. It is sold for use in steam irons and is quite inexpensive.

Overfilling leads to loss of electrolyte, resulting in poor battery performance, short life, and excessive corrosion. Never allow the electrolyte level to drop below the top of the plates. That portion of the plates exposed to air may be permanently damaged, resulting in loss of battery performance and shortened life.

Excessive use of water is an indication that the battery is being overcharged. The 2 most common causes of overcharging are high battery temperature or high voltage regulator setting. It is advisable to check the voltage regulator if this situation exists.

Cleaning

Check the battery occasionally for presence of dirt or corrosion. The top of the battery, in particular, should be kept clean. Acid film and dirt permit current to flow between terminals, which will slowly discharge the battery.

For best results when cleaning, wash first with diluted ammonia or baking soda solution, then flush with plenty of clean water. Take care to keep filler plugs tight so that no cleaning solution enters the cells.

Battery Cables

To ensure good electrical contact, cables must be clean and tight on battery terminals. If the battery or cable terminals are corroded, the cables should be disconnected and cleaned separately with a wire brush and baking soda solution. After cleaning, apply a very thin coating of petroleum jelly to the battery terminals before installing the cables. After connecting the cables, apply a light coating to the connection. This procedure will help to prevent future corrosion.

Battery Charging

WARNING

Do not smoke or permit any open flame in any area where batteries are being charged, or immediately after charging. Highly explosive hydrogen gas is formed during the charging process. Be sure to re-read Safety Precautions *in the beginning of this section.*

Motorcycle batteries are not designed for high charge or discharge rates. For this reason, it is recommended that a motorcycle battery be charged at a rate not exceeding 10 percent of its ampere-hour capacity. That is, do not exceed 1.5 amperes for a 15 ampere-hour battery. This charge rate should continue for 10 hours if the battery is completely discharged, or until specific gravity of each cell is up to 1.260-1.280, corrected for temperature. If after prolonged charging, specific gravity of one or more cells does not come up to at least 1.230, the battery will not perform as well as it should, but it may continue to provide satisfactory service for a time.

Some temperature rise is normal as a battery is being charged. Do not allow electrolyte temperature to exceed 110 degrees F. Should temperature reach that figure, discontinue charging until the battery cools, then resume charging at a lower rate.

Testing State of Charge

Although sophisticated battery testing devices are on the market, they are not available to the average motorcycle owner, and their use is beyond the scope of this manual. A hydrometer, however, is an inexpensive tool, and will tell much about battery condition.

To use a hydrometer, place the suction tube into the filler opening and draw in just enough electrolyte to lift the float. Hold the instrument in a vertical position and read specific gravity on the scale, where the float stem emerges from the electrolyte (**Figure 31**).

Electrolyte specific gravity varies with temperature, so it is necessary to apply a temperature correction to the reading so obtained. For each 10 degrees that battery temperature exceeds 80 degrees F, add 0.004 to the indicated specific gravity. Likewise, subtract 0.004 from the indicated value for each 10 degrees that battery temperature is below 80 degrees F.

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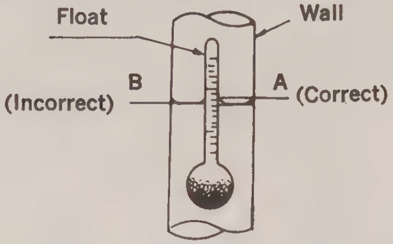


Repeat this measurement for each battery cell. If there is more than 0.050 difference (50 points) between cells, battery condition is questionable.

State of charge may be determined from **Table 7**.

Table 7 BATTERY CHARGE

Specific Gravity	State of Charge
1.110-1.130	Discharged
1.140-1.160	Almost discharged
1.170-1.190	One-quarter charged
1.220-1.220	One-half charged
1.230-1.250	Three-quarters charged
1.260-1.280	Fully charged

Don't measure specific gravity immediately after adding water. Ride the machine a few miles to ensure thorough mixing of the electrolyte.

It is most important to maintain batteries fully charged during cold weather. A fully charged battery freezes at a much lower temperature than does one which is partially discharged. Freezing temperature depends on specific gravity. **Table 8** illustrates the relationship between electrolyte specific gravity and freezing temperature.

WIRING DIAGRAMS

Wiring diagrams for most models covered are at the end of the book.

Table 8 FREEZING TEMPERATURE

Specific Gravity	Freezing Temperature (Degrees F)	Specific Gravity	Freezing Temperature (Degrees F)
1.100	18	1.200	—17
1.120	13	1.220	—31
1.140	8	1.240	—50
1.160	1	1.260	—75
1.180	—6	1.280	—92

NOTE: If you own a 1976 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER SEVEN

CHASSIS

This chapter discusses service on wheels, brakes, suspension, and related components.

HANDLEBAR

The handlebar is made from solid drawn steel tubing. The only handlebar components which should ever require service are throttle and spark control grips.

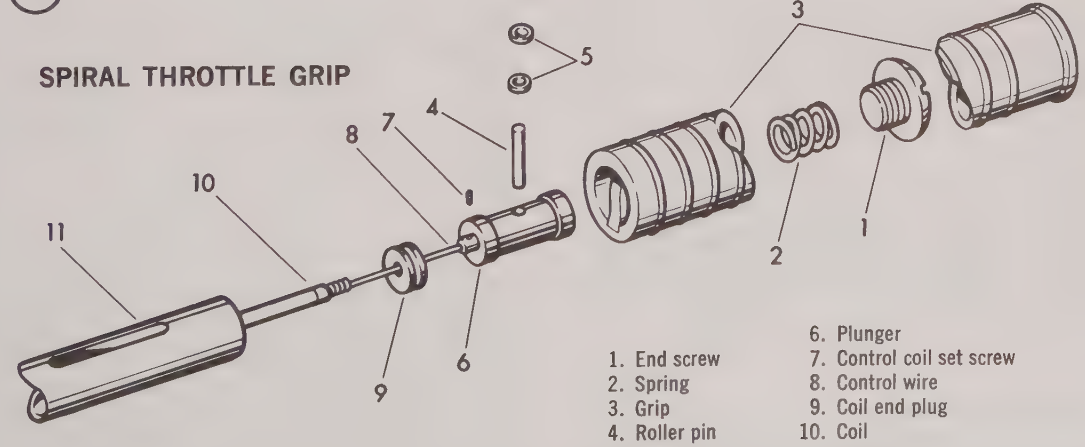
Examine the handlebar carefully for cracks or bends, especially after a collision or hard spill. Minor bends may be straightened. Replace the handlebar if any cracks exist, or if severely bent.

Spiral Grip

Figure 1 is an exploded view of this type throttle and spark control grip. Refer to that illustration during disassembly and service. To disassemble this control, proceed as follows.

①

SPIRAL THROTTLE GRIP



1. End screw
2. Spring
3. Grip
4. Roller pin
5. Roller
6. Plunger
7. Control coil set screw
8. Control wire
9. Coil end plug
10. Coil
11. Handlebar

1. Disconnect control coil and wire at the carburetor.

2. Remove handlebar end screw (1). This screw is difficult to remove at times; an impact driver will be a big help on this job. Alternately, insert a suitable punch into screw slot, then strike punch several times to loosen screw.

3. Remove handlebar end screw spring (2) and handlebar grip sleeve (3).

4. Remove control coil plunger roller pin (4) and both control coil plunger rollers (5).

5. Pull control coil plunger (6) and control wire (8) together from handlebar end. If control wire is broken, pull other piece from carburetor end. Control wire is retained in plunger by control coil set screw (7).

After disassembly, clean all parts in solvent. Replace any worn or damaged parts.

Reverse the disassembly procedure to assemble and install the throttle grip. Observe the following notes.

1. Be sure that screw (7) is registered in groove in control coil end plug.

2. Lubricate control wire with graphite grease or oil as it is inserted into control coil.

3. Install both rollers over roller pin, with round side of roller up as it is positioned on motorcycle.

4. The easiest way to install handlebar end screw is to grasp grip sleeve assembly and apply slight pressure against screw as it is started. Be sure to tighten screw securely.

5. After assembly, connect control coil and wire at carburetor or circuit breaker. Be sure that carburetor lever opens and closes fully as grip turns. There should be about ¼ in. between control coil clip on carburetor and throttle control coil when carburetor lever is fully closed against its stop.

End of spark control wire must point directly at hole in adjuster stud on circuit breaker when circuit breaker is in fully advanced position. End of control coil should extend about ⅜ in. beyond clamp.

Drum Throttle Grip

This control is used on later models. It incorporates a grip friction control. **Figure 2** is an exploded view of this control. Refer to that illustration during disassembly and service.

To disassemble this control, proceed as follows.

1. Remove both throttle control coil clamp screws (1), upper clamp (2), and lower clamp (3).

2. Disconnect ferrule end of control wire (9), then unsolder or cut off control wire ferrule (16).

3. Pull control wire (9) out from lower clamp.

4. Remove control adjuster locknut (5), control adjuster (6), control elbow (7), control elbow locknut (8), and control wire casing (10).

5. Replace worn or broken control wire by sliding it through control adjuster locknut, control adjuster, control elbow, and control elbow locknut. Then lubricate replacement wire with graphite grease and slide it into control wire casing.

6. Solder ferrule onto new wire flush with wire end.

During reassembly procedures, observe the following notes.

1. Apply a light coat of graphite grease to end of handlebar and also to inside surfaces of upper and lower clamps.

2. Connect ferrule end of control wire to notch in drum of throttle grip, then install grip onto handlebar between upper and lower clamps.

3. Be sure that hole in grip friction screw spring is in place on end of grip friction adjusting screw.

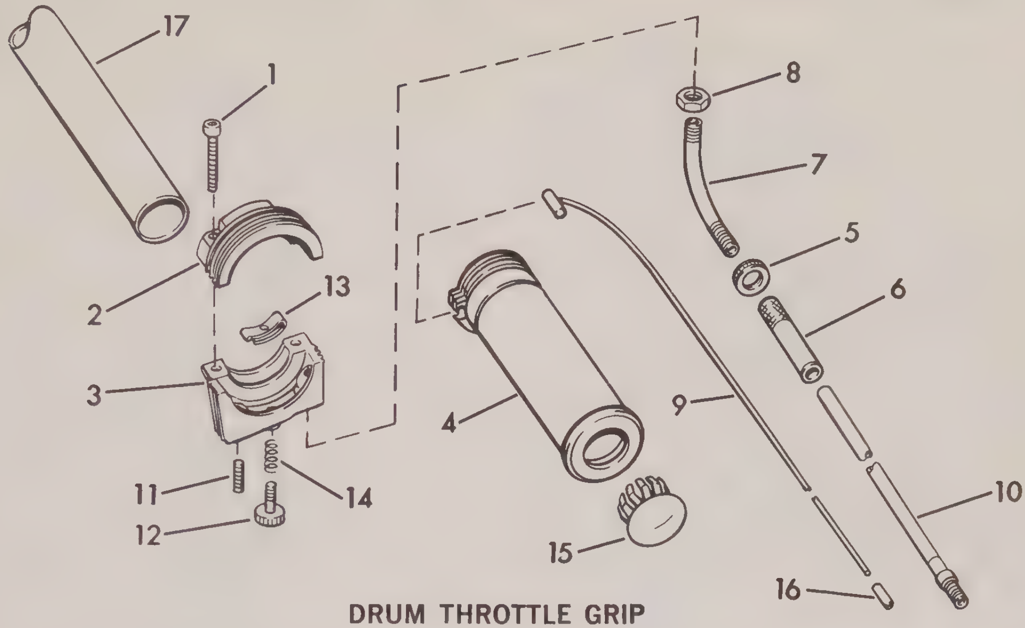
4. After assembling throttle grip and connecting at carburetor, be sure that carburetor spring returns grip to idle position. Note that grip friction screw must be loose.

5. After assembly, turn grip to open throttle fully, then turn stop screw with a 2mm Allen wrench to limit throttle grip travel.

FRONT FORK

Front fork assemblies consist essentially of 2 telescoping tubes enclosing springs, each with oil damping, and a steering head assembly. Front forks are of 3 types, Hydra-Glide, adjustable, and Super Glide. Service procedures for Hydra-Glide and adjustable forks are similar. Super Glide forks are discussed separately.

②



DRUM THROTTLE GRIP

1. Throttle control clamp screw
2. Upper clamp
3. Lower clamp
4. Throttle grip assembly
5. Control adjuster locknut
6. Control adjuster
7. Control elbow
8. Control elbow locknut
9. Control wire
10. Control wire casing
11. Stop screw
12. Grip friction adjusting screw
13. Grip friction spring
14. Grip friction screw spring
15. Grip plug
16. Control wire ferrule
17. Handlebar

Table 1 FORK REFILL QUANTITY

		Wet		Dry	
Model	**Year**	**Oz.**	**(cc)**	**Oz.**	**(cc)**
FL series	1959-1977	6.5	(190)	7.0	(210)
FX series	1973 on	5.0	(150)	6.0	(180)
FX series	1971-1972	5.5	(160)	6.5	(190)

Use Harley-Davidson "Type B" fork oil or SAE30 oil.

Fork Oil

Fork oil does not normally require periodic oil changes, except in the event of contamination or leakage. To drain fork oil, proceed as follows.

1. On adjustable forks, remove side panels or headlight housing and fork filler screws. On non-adjustable forks, remove upper bracket bolt from top of each fork tube.
2. Place a suitable drain pan under lower end of fork tube.
3. Remove drain plug.
4. Work fork up and down to help expel old oil.
5. Replace drain plug.
6. Refill each leg with the appropriate quantity of Harley-Davidson type "B" oil. See **Table 1**. If the fork has been disassembled, use the "dry" quantity. Otherwise, use the "wet" quantity.

A filler can be improvised as shown in **Figure 3**. Suspend can above fork leg, then fill can with correct quantity of oil. Work fork up and down. Oil will be sucked into fork.

Fork Inspection

If appreciable oil leakage develops, or fork does not work properly, proceed as follows.

1. Check and correct fork oil level by draining and refilling each fork leg. Excess oil will result in oil leakage; insufficient oil will result in faulty damping.
2. Examine drained oil for water. Water can cause fork oil to leak past fork slider bushings and seals, or to leak from fork tube cap.
3. If oil leaks from breather valve, replace it.
4. Replace slider tube bushings if oil bypasses them and leaks out at tops of sliders.
5. After a collision or spill, check fork alignment. If tubes, brackets, and stem are badly damaged, they must be replaced. Minor bends may be straightened by a shop equipped for such work.

Replacing Breather Valve

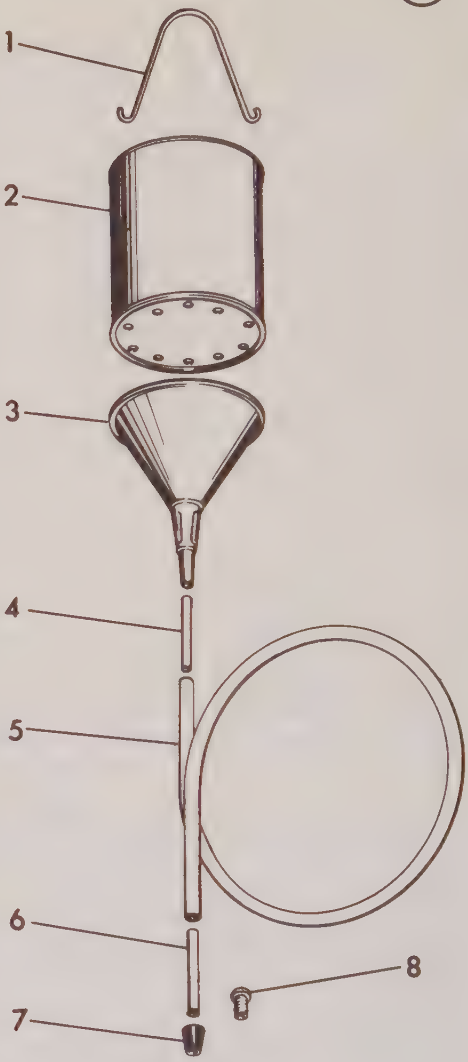
1. Remove upper bracket bolt which contains the valve.
2. Place fork tube cap in vise, then break 3 stake locks which retain valve.
3. Remove valve and replace with new one. When installing replacement valve, coat its seat with a suitable sealer.
4. Seat valve in bolt, then stake in 3 places.

Hydra-Glide Fork Disassembly

Figure 4 is an exploded view of this fork. Refer to it during disassembly and service.

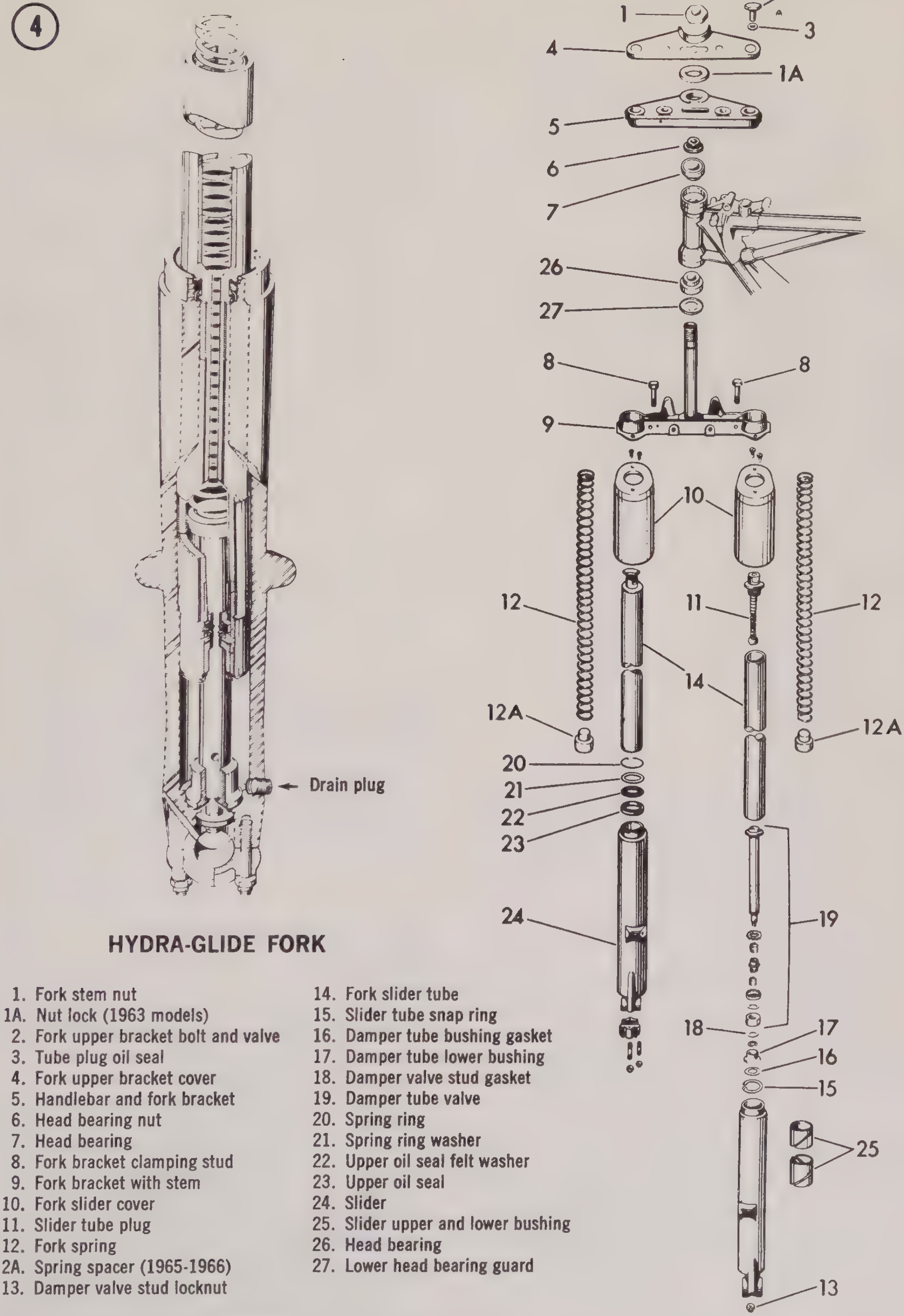
1. Support front of motorcycle so that front wheel is clear of floor.
2. Remove front wheel.
3. Remove fork stem nut (1) and nut lock (1A) on models so equipped.
4. Remove upper bracket bolts (2), oil seal (3), and cover (4) on models so equipped.
5. Remove handlebar and fork bracket (5).
6. Remove steering head bearing nut (6).
7. Remove upper bearing (7).
8. Pull fork assembly downward to remove it.
9. Loosen studs (8), then slide bracket (9) from fork tubes together with covers (10).

③



FORK OIL FILLER

1. Bail
2. Filler can
3. Tin funnel
4. Metal tubing
5. Flexible tubing
6. Metal tubing
7. Rubber plug
8. Fork tube cap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1
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1A
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12A
12A
20
21
22
23
24
19
18
17
16
15
25
13
Drain plug

HYDRA-GLIDE FORK

1. Fork stem nut
1A. Nut lock (1963 models)
2. Fork upper bracket bolt and valve
3. Tube plug oil seal
4. Fork upper bracket cover
5. Handlebar and fork bracket
6. Head bearing nut
7. Head bearing
8. Fork bracket clamping stud
9. Fork bracket with stem
10. Fork slider cover
11. Slider tube plug
12. Fork spring
12A. Spring spacer (1965-1966)
13. Damper valve stud locknut
14. Fork slider tube
15. Slider tube snap ring
16. Damper tube bushing gasket
17. Damper tube lower bushing
18. Damper valve stud gasket
19. Damper tube valve
20. Spring ring
21. Spring ring washer
22. Upper oil seal felt washer
23. Upper oil seal
24. Slider
25. Slider upper and lower bushing
26. Head bearing
27. Lower head bearing guard

10. Remove plugs (11), then invert sliders to drain oil and remove springs (12).

11. Remove nut (13), then pull slider tube (14) from slider.

12. Remove snap ring (15) and bushing (17).

13. Remove damper valve assembly (19).

14. Remove snap ring (20), washer (21), felt washer (22), and oil seal (23).

Adjustable Fork Disassembly

Figure 5 is an exploded view of this fork. Refer to it during disassembly and service.

1. Support motorcycle so that front wheel is free of floor.

2. Remove front wheel.

3. Remove steering damper screw (1), then remove the following components.

    a. Spring (2)
    b. Cover (3)
    c. Spring (4)
    d. Discs (5)
    e. Washers (6)
    f. Anchor plates (7)
    g. Washer (8)
    h. Disc (9)

4. Remove nut (10).

5. Remove bolts and washers (11), then lift off cover (12) and bracket (13).

6. Remove upper bearing (15), then slide fork assembly downward to remove it.

7. Remove plugs (16).

8. Loosen clamp studs (17).

9. Remove fork tube and slider assembly (22) from bracket (21).

10. Remainder of fork tube disassembly is the same as described for Hydra-Glide forks.

Super Glide Fork Disassembly

Figure 6 is an exploded view of this fork. Refer to it during disassembly and service.

1. Support motorcycle so that front wheel is clear of ground.

2. Remove the front wheel and brake as an assembly.

3. Remove headlight housing and front fender.

4. Remove fork tube cap (1).

5. Remove pinch bolt (4).

6. Pull fork leg downward to remove it from motorcycle.

7. On 1972 and earlier models, use fork piston rod retainer wrench, Harley-Davidson tool 94694-52, to disassemble fork spring retainer (7) from fork tube (8).

8. Remove spring (9), then drain oil from fork leg.

9. Remove bolt and washer (12). It may be necessary to insert a long screwdriver into slot in upper end of shock absorber to keep it from turning while removing bolt. On 1973 and later models, tool 94556-73 and extension are required to keep shock absorber from turning.

10. Free fork slider (10) from fork tube (8).

Inspection

Examine fork tubes carefully for badly worn or scored sliding surfaces. Also check fork slider bushings for wear or scoring. To check bushings for wear, insert fork tube into fork slider; if appreciable play exists, fork slider bushings should be replaced. Note that some forks do not have removable bushings. Slider must be replaced in the event of excessive wear.

It is suggested that straightening of fork tubes and replacement of slider bushings be done by a shop equipped for such work.

Super Glide Shock Absorbers (1971-1972)

Figure 7 is an exploded view of this shock absorber. Refer to that illustration during disassembly and service.

1. Remove snap ring (1).

2. Remove lower valve body (2), valve washer (3), upper valve body (4), and spring (5).

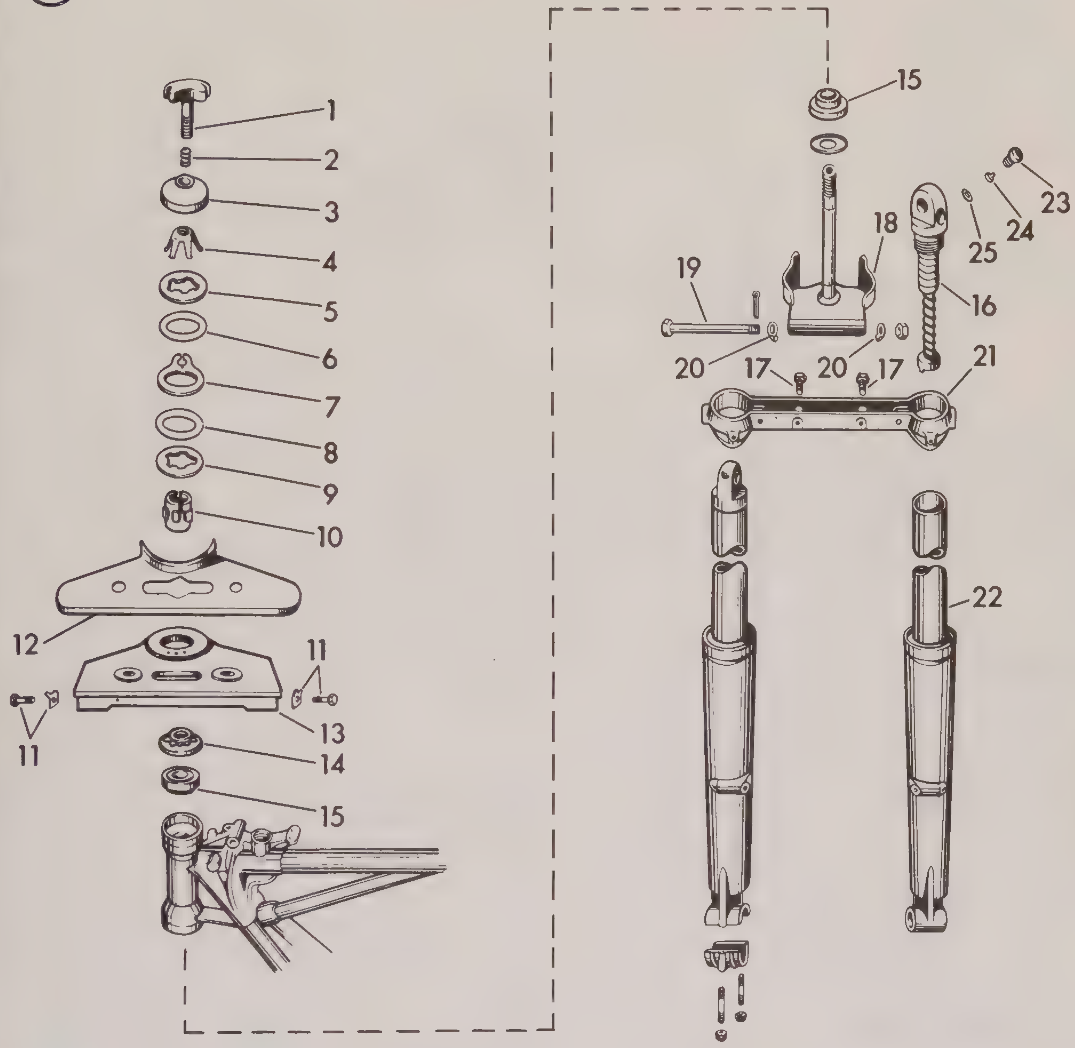
3. Remove shock absorber tube (8).

4. Remove snap ring (6), then piston (7).

Examine all parts for wear or damage. Pay particular attention to the following items.

1. Check fit of piston (7) in fork tube (9). Also check fit on shock absorber tube (8).

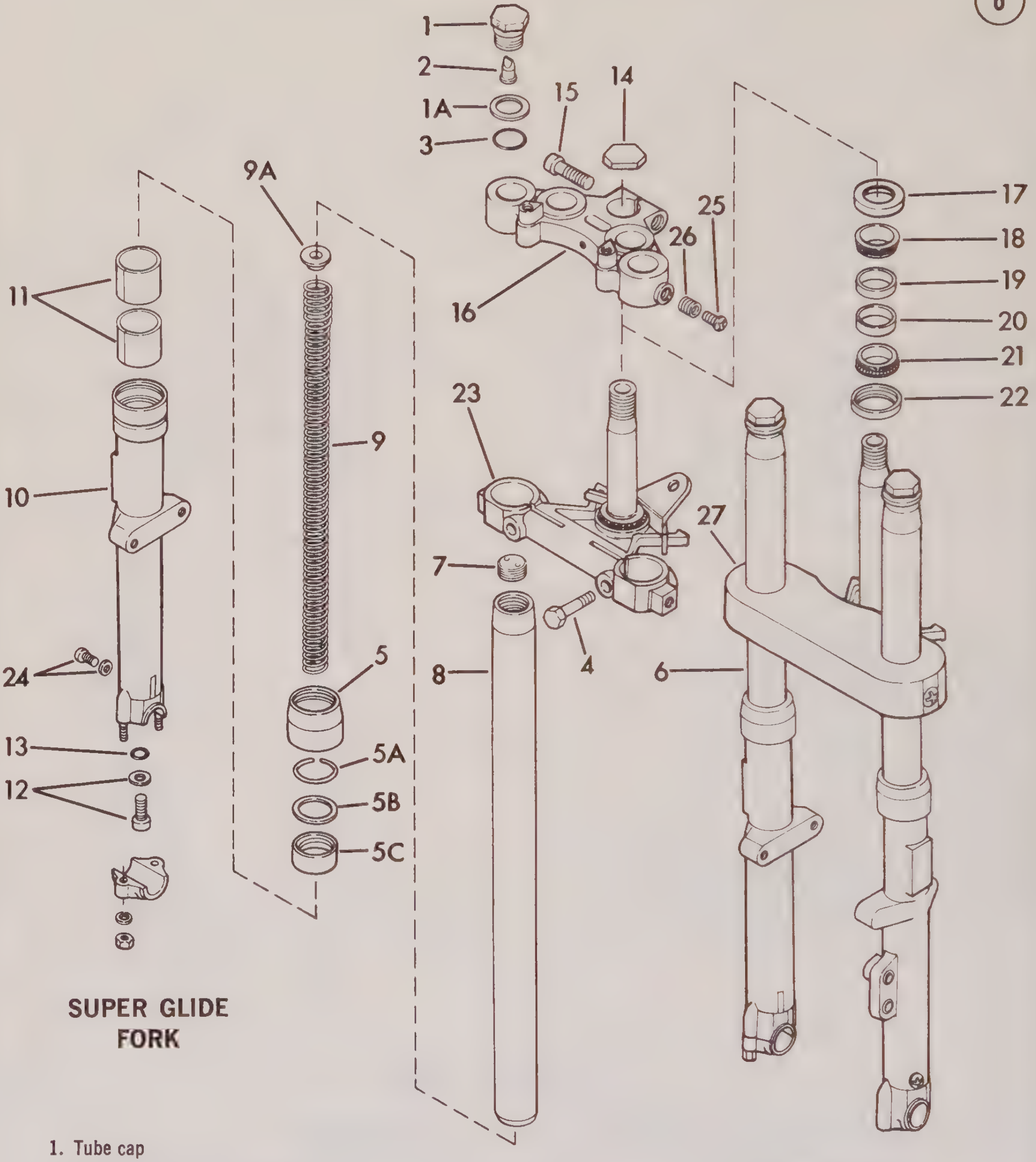
⑤



ADJUSTABLE FORK

1. Steering damper adjusting screw
2. Spring
3. Spider spring cover
4. Spider spring
5. Pressure disc
6. Friction washer
7. Anchor plate
8. Friction washer
9. Pressure disc
10. Fork stem nut
11. Upper bracket bolt and washer
12. Upper bracket cover
13. Upper bracket
14. Head bearing nut
15. Head bearing
16. Slider tube plug
17. Bracket clamping stud
18. Bracket with stem
19. Bracket bolt with nut and cotter pin
20. Bracket bolt washer
21. Bracket
22. Fork tube and slider assembly
23. Filler screw
24. Filler screw valve
25. Filler screw washer

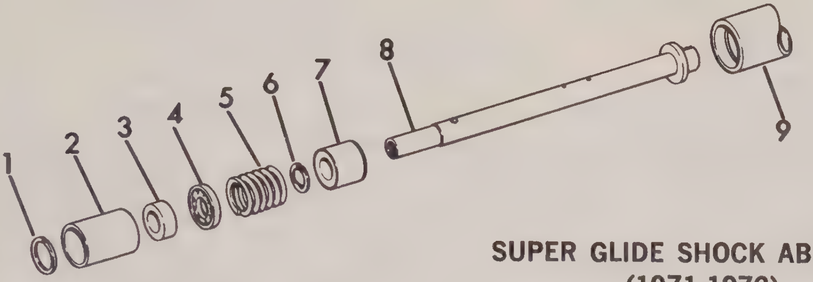
⑥



SUPER GLIDE
FORK

1. Tube cap
1A. Cap washer (1973 and later)
2. Tube breather valve (1972 and earlier)
3. Tube cap seal
4. Pinch bolt
5. Fork boot
5A. Retaining ring (1973 and later)
5B. Retaining washer (1973 and later)
5C. Seal
6. Fork side
7. Spring retainer (1972 and earlier)
8. Fork tube and shock absorber assembly
9. Fork spring
9A. Spring guide (1973 and later)
10. Fork slider
11. Fork slider bushing (1972 and earlier)
12. Tube end bolt and washer
13. O-ring (1972 and earlier)
14. Fork stem nut
15. Upper bracket pinch bolt
16. Upper bracket
17. Upper bearing shield
18. Upper bearing cone
19. Upper bearing cup
20. Lower bearing cup
21. Lower bearing cone
22. Lower bearing shield
23. Lower bracket and stem
24. Drain screw and washer
25. Cover screw
26. Cover screw insert
27. Cover

⑦



1. Retaining ring
2. Valve body, lower
3. Valve washer
4. Valve body, upper
5. Spring
6. Piston retaining ring
7. Piston
8. Shock absorber tube
9. Fork tube
C. Slot

SUPER GLIDE SHOCK ABSORBER
(1971-1972)

2. Check seating of valve washer (3) on faces of upper valve body (4) and lower valve body (2).

Super Glide Shock Absorber (1973 and Later)

Figure 8 is an exploded view of this shock absorber. Refer to that illustration during disassembly and service.

1. Remove snap ring (1).
2. Remove lower piston (2), lower stop (3), orifice washer (4), valve (5), spring washer (6), valve body (7), snap ring (8), and upper piston (9).
3. Remove roll pin (10) from shock absorber tube (6), then unscrew upper stop (11).

Inspection of shock absorber components is generally similar to that of 1971-1972 models.

When reassembling shock absorber, be sure to install upper valve body so that its outer lip fits over the spring.

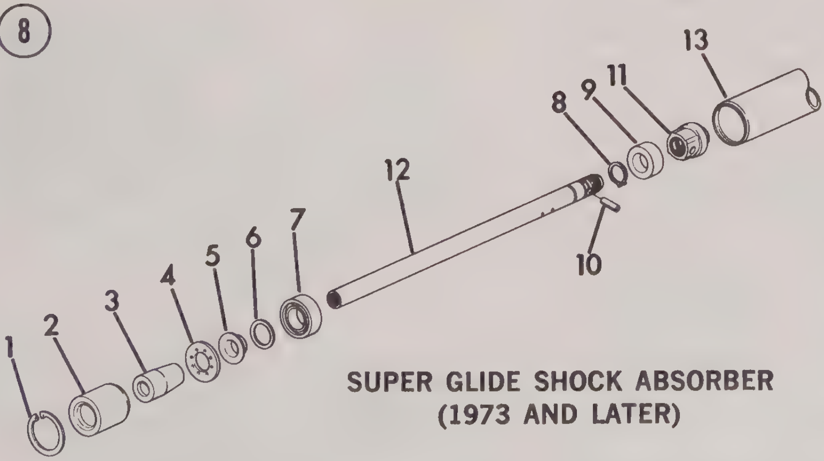
FORK STEM AND BRACKET

Figure 6 illustrates a typical fork stem and bracket assembly (16) and (23). Refer to that illustration during disassembly and service.

Removal

1. Support motorcycle so front wheel is free.
2. Remove front wheel and brake.
3. Disconnect wiring at panel.

⑧



SUPER GLIDE SHOCK ABSORBER
(1973 AND LATER)

1. Retaining ring
2. Lower piston
3. Lower stop
4. Orifice washer
5. Valve
6. Spring washer
7. Valve body
8. Retaining ring
9. Upper piston
10. Roll pin
11. Upper stop
12. Shock absorber tube
13. Fork tube

4. Remove front fender and headlight housing.
5. Loosen fork tube pinch bolts.
6. Remove each fork leg downward.
7. Remove headlight and its bracket together.
8. Remove handlebar clamp cover.
9. Remove fork stem nut (14).
10. Loosen pinch bolt (15).
11. Lift entire handlebar and upper bracket assembly away from work area. Do not bend cables more than necessary.
12. Remove shield (17) and bearing cone (18).
13. Pull fork stem downward, then remove bearing cone (21) and dust shield (22).

Inspection

Fork stems may be straightened if bent slightly, but the job requires special jigs and fixtures. It is suggested that this job be done by a shop specializing in such work.

Check bearings for wear, cracks, or rust. Replace entire bearing assembly if any part is damaged. Do not use a combination of new and used parts.

Installation and Adjustment

Stem and bracket assembly and installation is essentially the reverse of disassembly. Observe the following notes.

1. Hold bearings in place with heavy grease.
2. Tighten stem nut until all appreciable play is taken up. Be sure that bearing action is smooth when stem is turned through its entire range of travel.
3. After reassembling fork legs, front fender, and front wheel, again check for free movement, with no appreciable shake or sideways movement of front fork. Adjust stem nut as required to achieve this condition.
4. Be sure pinch bolts are securely tightened.

WHEELS

Care given to wheels and tires is reflected in good tire mileage and handling qualities. For safety's sake, wheels and tires should be inspected regularly, and any minor discrepancies corrected at once. **Table 2** lists wheel service items which should be attended to at intervals of not more than 5,000 miles, or at any time handling irregularities develop.

Table 2 WHEEL SERVICE

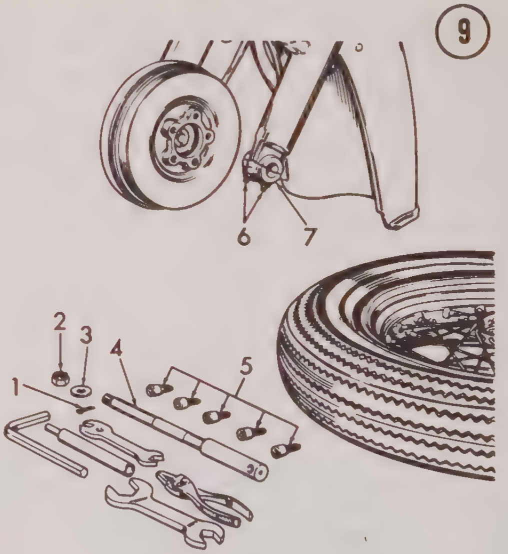
Check for	Service Required
Loose wheel hubs	Replace wheel bearings
Loose spokes	Tighten or replace
Rear wheel alignment	Align rear wheel
Loose axle nuts	Tighten nuts
Tire wear	Replace tire
Distorted rims	True wheels
Tire inflation	Refer to Chapter Two
Tire balance	Balance if required

Front Wheel Removal and Installation (1972 and Earlier Electra-Glide)

Refer to **Figure 9**, then proceed as follows.

1. Support front of motorcycle so that front wheel is clear of floor.

9



1. Cotter pin
2. Axle nut
3. Flat washer
4. Front axle
5. Wheel mounting screws
6. Slider cap nuts
7. Slider cap

2. Remove the cotter pin (1), nut (2), and washer (3).
3. Remove mounting screws (5).
4. Loosen nuts (6) on fork sliders.
5. Pull out axle (4) to remove wheel. It is not necessary to remove brake drum.

Front wheel removal is similar for models with disc brakes. It is not necessary to remove brake disc from wheel.

Reverse the removal procedure to install the front wheel. Observe the following notes.

1. Be sure that mating surfaces on brake drums and wheel are clean.
2. Tighten screws (5) alternately to prevent wheel runout.
3. To ensure alignment of parts, do not tighten fork slider nut (6) until axle nut (2) is tight.

Front Wheel Removal/Installation (1973 and Later Electra-Glide)

1. Support the motorcycle with the front wheel off the ground.
2. Remove the axle end caps, if so equipped.
3. Remove the axle nut, lockwasher, and washer.
4. Loosen the nuts on the bottom of the fork sliders.
5. Pull out the axle.
6. Remove the wheel and hub caps.

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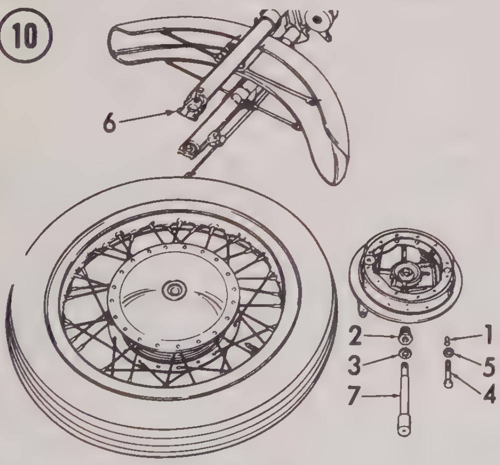


1. Brake clevis pin
2. Axle nut
3. Axle nut lockwasher
4. Brake anchor and centering cap screw
5. Brake anchor and centering cap screw lockwasher
6. Front axle pinch bolt
7. Front wheel axle

Front Wheel Removal (1972 and Earlier Super Glide)

Refer to **Figure 10**, then proceed as follows.

1. Support front of motorcycle so that front wheel is clear of floor.
2. Remove brake clevis pin (1).
3. Remove axle nut (2) and axle nut lockwasher (3).
4. Remove cap screw (4) and lockwasher (5).
5. Loosen pinch bolt (6).
6. Using a soft mallet, tap out axle (7).
7. Remove front wheel and brake together.

Reverse the removal procedure to install the front wheel. Observe the following notes.

1. Be sure to grease wheel bearings and pack one ounce of grease into wheel hub.
2. Center brake shoes. Refer to *Front Brake Adjustment* for procedure.
3. Be sure that front wheel spins freely upon installation.

Front Wheel Removal and Installation (1973 FX)

1. Support motorcycle so that front wheel is clear of floor.
2. Remove front axle nut and lockwasher.
3. Loosen nuts which secure caps on fork slider.
4. Tap left-hand end of front axle with a soft mallet, then pull it out.
5. Remove front wheel and speedometer drive.

Installation is essentially the reverse of removal. Observe the following notes.

1. Be sure that brake pads are aligned so that brake disc goes between pads.
2. Be sure ear on speedometer drive engages hole in wheel hub.
3. Torque axle nut to 50 ft.-lb., then tighten fork slider cap nuts.

Front Wheel Removal and Installation (1974 and Later FX)

1. Support front of motorcycle so that front wheel is clear of floor.
2. Remove brake caliper mounting bolt.
3. Remove front axle nut, washer, and lockwasher.
4. Loosen fork slider cap nut.
5. Start front axle by tapping its left end with a soft mallet, then pull it out.
6. Remove front wheel and speedometer drive.

Installation is essentially the reverse of removal. Observe the following notes.

1. Be sure brake pads are aligned so that brake disc goes between pads.
2. Be sure that ear on speedometer drive engages hole in wheel hub.
3. Torque axle nut to 50 ft.-lb., then tighten fork slider cap nuts.

Rear Wheel Removal and Installation (1972 and Earlier)

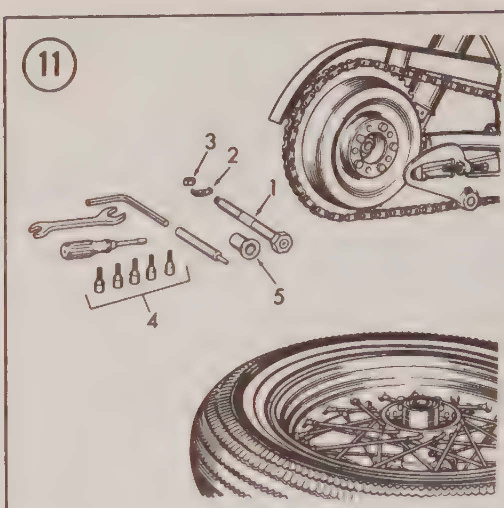
Refer to **Figure 11**, then proceed as follows.

1. Support rear of motorcycle so that rear wheel is free of floor.
2. Remove rear screws from fender support, then raise rear of fender.
3. Remove screws (4). Note that these screws can be removed only when they are to rear of axle; it is necessary to rotate rear wheel to remove each screw in turn.
4. Remove nut (3) and lockwasher (2).
5. Pull out axle (1).
6. Remove spacer (5).
7. Apply rear brake, then remove wheel from motorcycle.

Reverse the foregoing procedure to install the rear wheel. Observe the following notes.

1. Be sure that mating surfaces of wheel and brake drum are clean.
2. Tighten wheel mounting screws (4) securely before tightening axle nut (3).

(11)



1. Rear wheel axle
2. Rear wheel axle nut lockwasher
3. Rear wheel axle nut
4. Rear wheel mounting screws
5. Rear wheel axle spacer

Rear Wheel Removal and Installation (1973 and Later)

1. Support rear of motorcycle with rear wheel free of floor.
2. Disconnect drive chain at master link. It may be necessary to rotate rear wheel until master link is in a convenient position for removal.
3. Remove anchor nut and cotter pin (5). Loosen castellated nut.
4. Remove axle nut, axle nut lockwasher, and spacer which fits between fork side and sprocket side of wheel hub.
5. Remove wheel and brake disc together.

Reverse the foregoing procedure to install the rear wheel. Upon installation, torque axle nut to 50 ft.-lb. Be sure to adjust drive chain tension.

Wheel Hubs (1966 and Earlier)

Figure 12 is an exploded view of this hub. Refer to it during disassembly and service. Note that hubs are interchangeable but that bearings (11, 12, 20, and 21) and shims (7) are selectively fitted. Take care to keep these parts separate so that they may be returned to their original locations.

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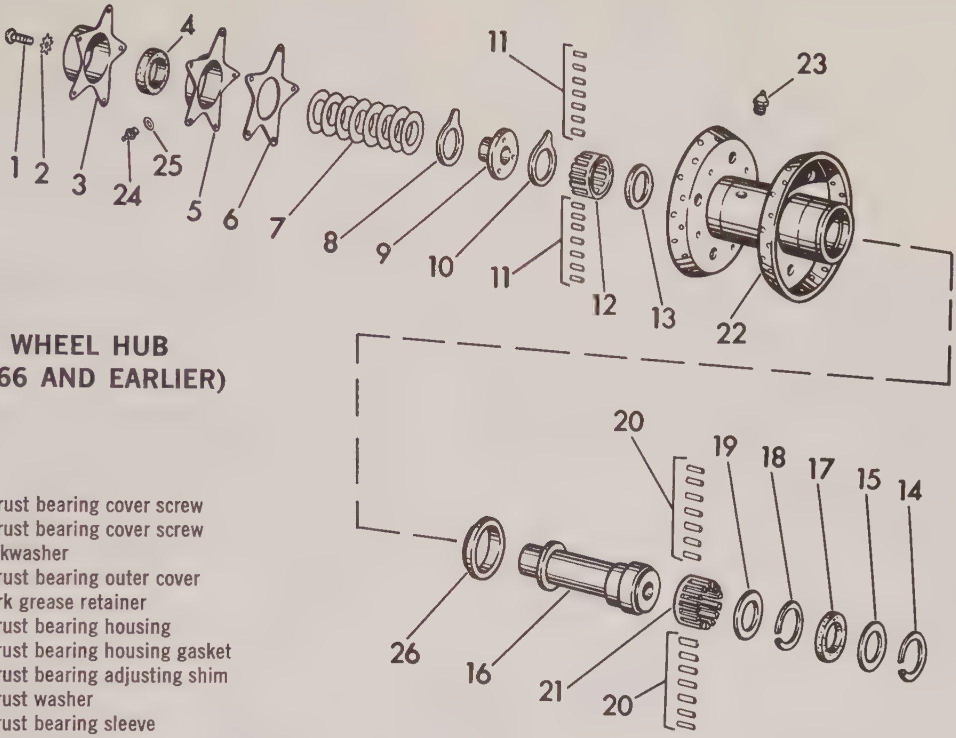

WHEEL HUB
(1966 AND EARLIER)

1. Thrust bearing cover screw
2. Thrust bearing cover screw lockwasher
3. Thrust bearing outer cover
4. Cork grease retainer
5. Thrust bearing housing
6. Thrust bearing housing gasket
7. Thrust bearing adjusting shim
8. Thrust washer
9. Thrust bearing sleeve
10. Thrust washer
11. Bearing roller
12. Roller retainer
13. Roller retainer thrust washer
14. Roller bearing spring lock ring
15. Retaining washer
16. Hub inner sleeve
17. Cork grease retainer
18. Roller bearing spring lock ring
19. Roller bearing washer
20. Bearing roller
21. Roller retainer
22. Hub shell
23. Grease fitting
24. Grease fitting
25. Plain washer
26. Roller retainer thrust collar

1. Remove thrust bearing cover screws (1) and lockwashers (2).

2. Remove cover (3), cork grease retainer (4), housing (5), gasket (6), shims (7), thrust washer (8), sleeve (9), and thrust washer (10).

3. Remove bearing rollers (11), bearing retainer (12), and thrust washer (13).

4. Remove lock ring (14), washer (15), sleeve (16), cork grease retainer (17), lock ring (18), and washer (19).

5. Remove bearing rollers (20) and bearing retainer (21).

Clean all parts in solvent, then inspect for wear or damage. Add one or more thrust bearing adjustment shims (7) to take up side-play. Note that thrust bearing sleeve (9) must be free when thrust bearing outer cover (3) is screwed down into position. Proper clearance should be 0.005 to 0.007 in. Note that cork grease retainer (4) should not be installed when adjusting side play.

Install oversize bearing rollers (11 and 20) as required to adjust radial play. Rollers are available from 0.001 in. undersize to 0.001 in. oversize in steps of 0.0002 in. Select rollers to provide 0.0010 to 0.0015 in. radial clearance.

After fitting bearings, grease rollers, races, and thrust washers lightly.

Reverse the disassembly procedure to assemble the hub. Observe the following notes.

1. Closed side of each bearing retainer (12 and 21) goes toward center of hub.

2. If grease fitting (24) was removed, be sure to install a washer (25) under it upon installation. Failure to do so will cause grease fitting to crimp shims (7).

3. Inject one ounce of grease into hub after installation. Do not overlubricate.

Electra-Glide Hubs (1967-1972)

Figure 13 is an exploded view of this hub. Refer to it during disassembly and service.

1. Remove screws (1).
2. Remove brake drum (2) or brake disc flange (2A).
3. Remove spacer (3).
4. Press out bearing or bearings (8) and oil seal (8A) and spacer (8B) if so equipped.
5. On 1970 and later models, remove screws (10) and retainer (11).
6. Remove locknut (4). This nut has a left-hand thread. Tool 94630-67 is available for removing this nut.
7. Remove seal (5) and spacer (6).
8. Press out bearing (7) from hub.

After disassembly, examine bearings for looseness and rough operation. Be sure that oil seal (5) is in good condition. Replace worn or defective parts.

Reverse foregoing Steps 1 through 8 to assemble hub. Tighten locknut (4) with its special tool, then stake it to hub in 4 places so that it

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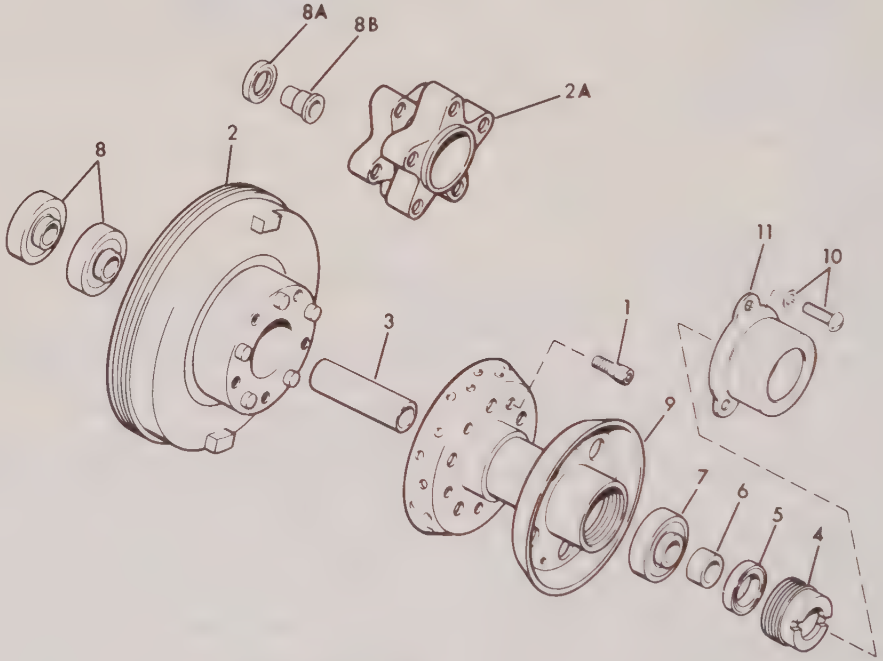


ELECTRA-GLIDE HUB — 1967-1972

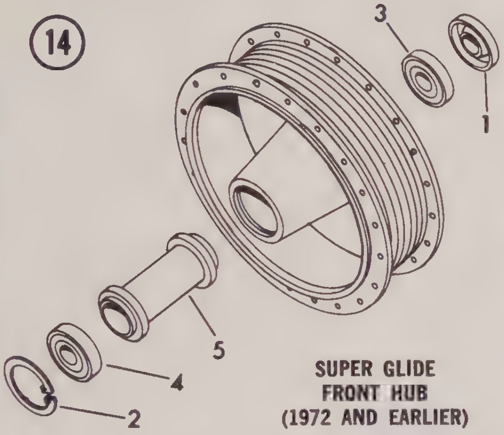
1. Wheel mounting socket screw
2. Brake drum (front shown)
2A. Brake disc flange (1972 and later)
3. Bearing spacer
4. Bearing locknut
5. Seal
6. Spacer
7. Ball bearing
8. Ball bearing (1 front) (2 rear)
8A. Oil seal (1972)
8B. Spacer (1972)
9. Wheel hub
10. Bearing retainer screw
11. Bearing locknut retainer

cannot loosen. On 1970 and later models, staking is not necessary; drive retainer into locknut slots with a chisel to lock nut into position. Tighten screws (1) alternately to prevent wheel runout. Pack cavity between bearings with grease.

Super Glide Front Hub (1972 and Earlier)

Figure 14 is an exploded view of this hub. Refer to it during disassembly and service.

14



SUPER GLIDE FRONT HUB (1972 AND EARLIER)

1. Grease retainer
2. Retaining ring
3. Ball bearing
4. Ball bearing (brake side)
5. Bearing spacer

1. Pry grease seal (1) from front wheel hub.
2. Remove snap ring (2).
3. Drive bearing (3) inward until it is fully seated. This operation moves bearing (4) far enough outward that bearing spacer (5) can be moved from bearing (4).
4. Using a long drift, tap out bearing (4) from opposite end.
5. Tap out bearing (3).

Clean all parts in solvent, then dry. Do not spin bearings by blasting them with compressed air. Replace bearings if they exhibit side play or radial play, roughness, discoloration, or damage to balls or races. Be sure that spoke flanges are not bent or damaged. Check brake drum for deep grooves. Replace any defective parts.

Interchangeable Hubs (1973 and Later)

Figure 15 is an exploded view of this hub. Refer to it during disassembly and service.

1. Remove snap rings (1).
2. Remove washers (2), spacers (3), oil seal (4), and bearing cones (5).
3. Using a suitable puller, remove bearing cups (6).
4. Remove spacer (7).

Clean all parts in solvent, then inspect for wear or damage. Bearing end-play should be 0.0005-0.014 in. with an axial load of 100 pounds applied to bearing cones; adjust with a longer or shorter spacer (7) if required.

Reassembly is essentially the reverse of foregoing Steps 1-4. Observe the following notes.

1. Grease the bearing cones liberally before assembly.
2. Press oil seals ¼ in. into hub.
3. Lubricate oil seal lips before installing spacer (3).

Super Glide Front Hub (1973 and Later)

Figure 16 is an exploded view of this hub. Refer to it during disassembly and service.

1. Remove oil seals (1), spacer (2), and bearing cones (3).
2. Using a suitable puller, remove bearing cups (4).
3. Remove spacer (5).
4. Remove bolts or screws (8 or 8A) which retain brake disc (6 or 6A).

Clean all parts in solvent, then dry. Carefully examine bearing cups and cones for discoloration or damage. Assemble bearings and check for smooth operation. Be sure that spoke flanges are not bent or damaged. Replace any defective parts if necessary.

Reverse the disassembly procedure to reassemble hubs. Observe the following notes.

1. Pack the bearing cones with grease before installation.
2. Press oil seals in until they are flush with hub.
3. Lubricate oil seal lip before inserting spacer (7).

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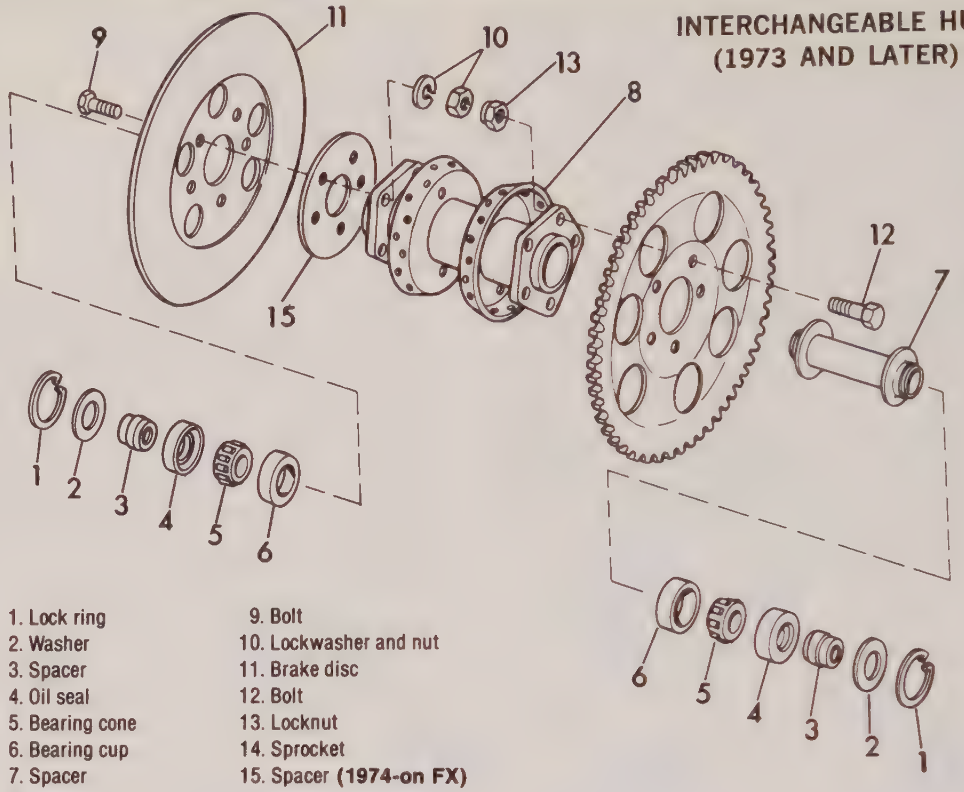
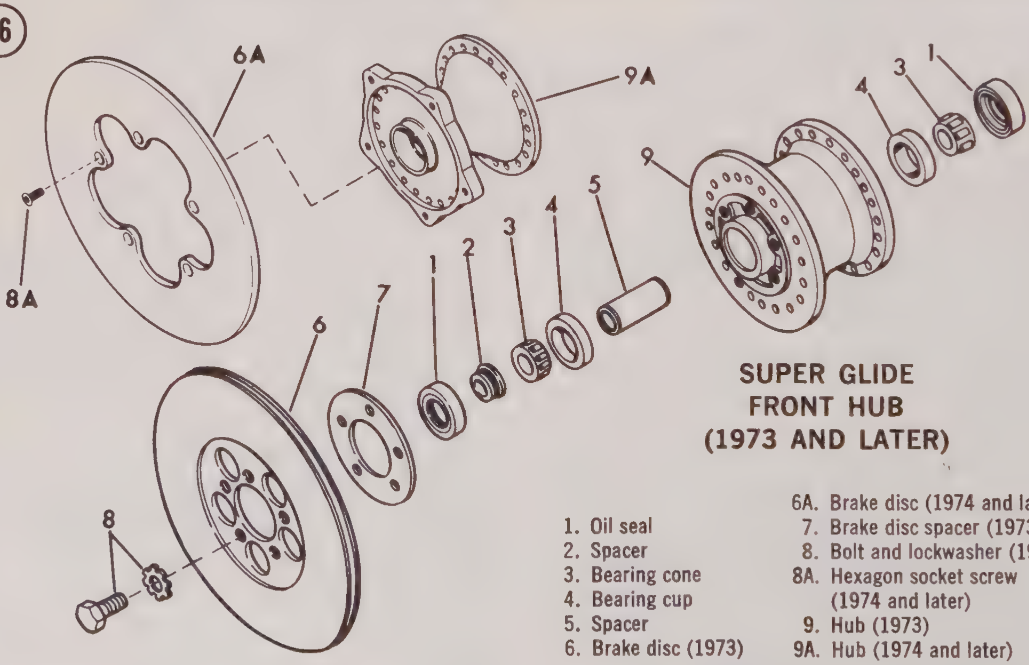
INTERCHANGEABLE HUB (1973 AND LATER)



1. Lock ring
2. Washer
3. Spacer
4. Oil seal
5. Bearing cone
6. Bearing cup
7. Spacer
8. Hub
9. Bolt
10. Lockwasher and nut
11. Brake disc
12. Bolt
13. Locknut
14. Sprocket
15. Spacer **(1974-on FX)**

⑯

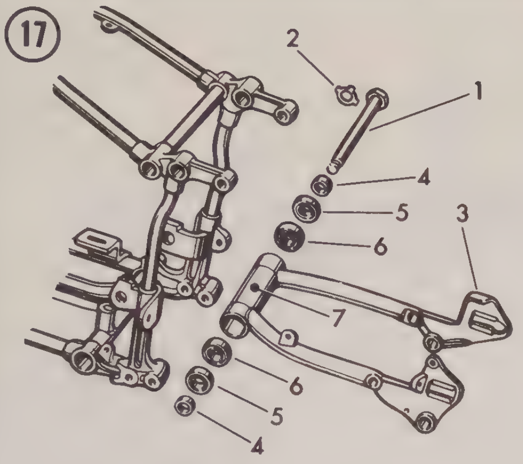


SUPER GLIDE FRONT HUB (1973 AND LATER)

1. Oil seal
2. Spacer
3. Bearing cone
4. Bearing cup
5. Spacer
6. Brake disc (1973)

6A. Brake disc (1974 and later)
7. Brake disc spacer (1973)
8. Bolt and lockwasher (1973)
8A. Hexagon socket screw (1974 and later)
9. Hub (1973)
9A. Hub (1974 and later)

⑰



1. Pivot bolt
2. Pivot bolt lockwasher
3. Rear fork
4. Pivot bearing spacer
5. Bearing seal
6. Bearing
7. Grease fitting

4. Torque brake disc retaining bolts (8) to 35 ft.-lb. Torque screws (8A) to 10 ft.-lb. Be sure that brake disc and its mounting surface are clean and flat before assembly.

5. After wheel is installed, bearing end-play should be 0.0025 to 0.015 in. Longer or shorter spacers (5) are available to establish correct end-play.

Spokes

Spokes should be checked for tightness. The "tuning fork" method of checking spoke tightness is simple and works well. Tap each spoke with a spoke wrench or shank of a screwdriver and listen to the tone. A tightened spoke will emit a clear, ringing tone; a loose spoke will sound flat. All spokes in a correctly tightened wheel will emit tones of similar pitch but not necessarily the same precise tone.

Bent or stripped spokes should be replaced as soon as they are detected. Unscrew the nipple from the spoke and depress the nipple into the rim far enough to free the end of the spoke, taking care not to push the spoke all the way in. Remove the damaged spoke from the hub and use it to match a new spoke of identical length. If necessary, trim the new spoke to match the original and dress the end of the threads with a die. Install the new spoke in the hub and screw on the nipple, tightening it until the spoke's tone is similar to the tone of the other spokes on the wheel. Periodically check the new spoke; it will stretch and must be retightened several times before it takes its final set.

Wheel Balance

An unbalanced wheel results in unsafe riding conditions. Depending on the degree of unbalance and speed of the motorcycle, the rider may experience anything from a mild vibration to a violent shimmy which may even result in loss of control. Balance weights may be installed to spokes on the light side of the wheel to correct this condition.

Before attempting to balance wheels, check to be sure that the wheel bearings are in good condition and properly lubricated. Also make sure that brakes don't drag, so that wheels rotate freely. With the wheel free of the ground, spin it slowly and allow it to come to rest by itself. Add balance weights to the spokes on the light side as required, so that the wheel comes to rest at a different position each time it is spun. Balance weights are available in weights of ⅓, ⅔, and 1 oz.. Remove the drive chain before balancing rear wheel.

If more than one ounce is required to balance the wheel, add weight to adjacent spokes; never put 2 or more weights on the same spoke. When the wheel comes to rest at a different point each time it is spun, consider it balanced, then tightly crimp weights so they won't be thrown off.

SWINGING ARM

Figure 17 is an exploded view of a typical rear suspension swinging arm. Refer to it during disassembly and service.

Removal

1. Remove rear wheel.

2. Remove rear brake side cover together with its control linkage.

3. Bend tab on lockwasher (2), then remove pivot bolt (1).

4. Press out spacers (4), seals (5), and bearings (6).

Inspection

Check swinging arm for bends or misalignment. Special alignment jigs and fixtures are required for alignment. If such work is required, any Harley-Davidson dealer can arrange for factory alignment.

Replace bearings if they are worn or pitted. If bearings are OK, clean them and repack with fresh grease.

Installation

Assembly and installation is essentially the reverse of removal and disassembly. Observe the following notes.

1. Pack cavity between bearings (6) and seals (5) with grease.
2. On 1962 and later models, inject a small quantity of grease into grease fitting to fill space between bearings. This operation should be performed every 2,000 miles.
3. After swinging arm is installed on motorcycle, lift rear end with a spring scale. Note force required to lift swinging arm to a horizontal position.
4. Tighten bearing pivot bolt (1) to provide an additional 1 to 2 pounds drag on bearing. As an example: If 4 pounds force is required to lift rear of swinging arm, tighten right bearing locknut until 5 to 6 pounds force is required.
5. Be sure to bend tab on lockwasher (2) to lock pivot bolt (1).
6. Assemble rear wheel.
7. Adjust drive chain tension.

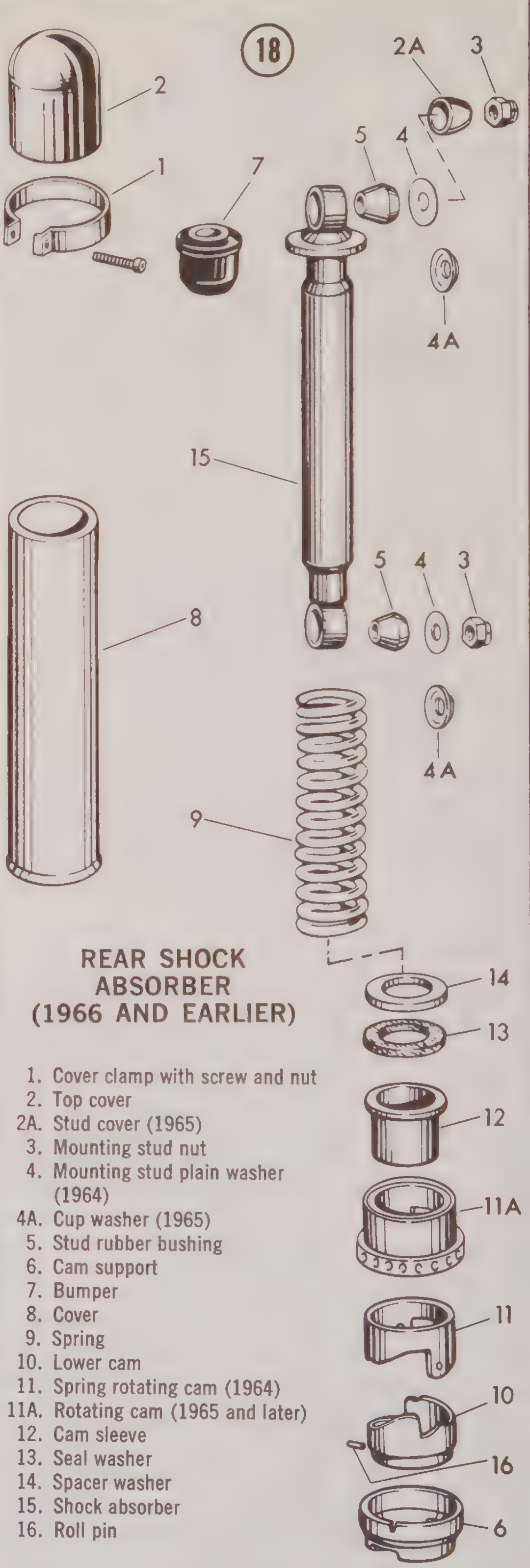
REAR SHOCK ABSORBERS

Harley-Davidson rear shock absorbers are adjustable to 3 positions. The lowest position, off the cam, is for solo riders of approximately 150 pounds. First cam position is for heavier solo riders. Second cam position is for tandem riding.

Disassembly (1966 and Earlier)

Figure 18 is an exploded view of this shock absorber. Refer to that illustration during service.

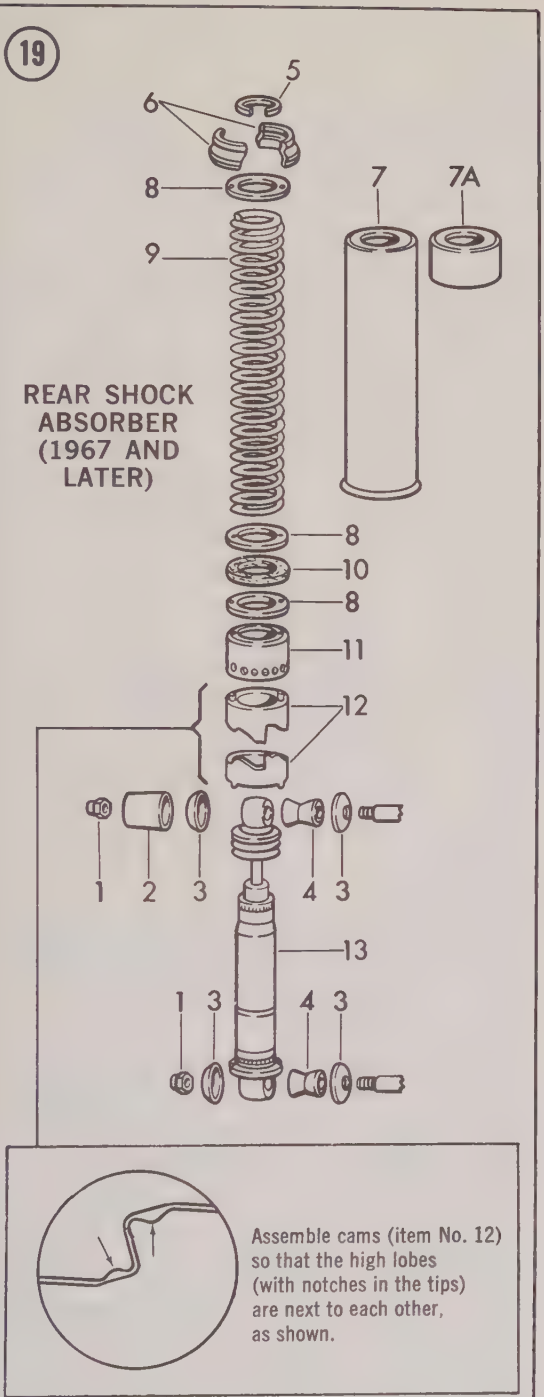
18



REAR SHOCK ABSORBER (1966 AND EARLIER)

1. Cover clamp with screw and nut
2. Top cover
2A. Stud cover (1965)
3. Mounting stud nut
4. Mounting stud plain washer (1964)
4A. Cup washer (1965)
5. Stud rubber bushing
6. Cam support
7. Bumper
8. Cover
9. Spring
10. Lower cam
11. Spring rotating cam (1964)
11A. Rotating cam (1965 and later)
12. Cam sleeve
13. Seal washer
14. Spacer washer
15. Shock absorber
16. Roll pin

⑲



Assemble cams (item No. 12) so that the high lobes (with notches in the tips) are next to each other, as shown.

1. Mounting stud nut
2. Stud cover
3. Cup washer
4. Stud rubber bushing
5. Retaining ring
6. Split key
7. Cover (long)

7A. Cover (short)
8. Washer
9. Spring
10. Seal washer
11. Adjusting cup
12. Cam
13. Shock absorber unit

1. Support rear of motorcycle. If blocking facilities are not available, work on only one shock absorber at a time. Remaining shock absorber will hold swinging arm in position.

2. Loosen cover clamp (1), then slip off the top cover (2).

3. Remove both mounting stud nuts (3), stud cover (2A) on 1965 models, washers (4 or 4A), and rubber bushings (5).

4. Slip entire shock absorber assembly from its mounting studs.

5. Compress shock absorber spring (9) enough to turn lower eye of shock absorber 90 degrees into cam support slot. Tool 97010-52A is available to make this job easy.

6. Release spring pressure, then remove shock absorber assembly from tool.

7. Remove cam support (6).

8. Rap lower end of shock absorber smartly to free bumper (7) from its retaining flange inside cover (8).

9. Remove spring and shock absorber from cover, then remove lower cam (10), spring rotating cam (11 and 11A), cam sleeve (12), dirt seal (13), and spacer washers (14) from the shock absorber.

10. Bumper (7) may be removed after extending shock absorber.

Disassembly (1967 and Later)

Figure 19 is an exploded view of this shock absorber. Refer to that illustration during service.

1. Support rear of motorcycle. If blocking facilities are not available, work on only one shock absorber at a time. Remaining shock absorber will hold swinging arm in position.

2. Remove both mounting stud nuts (1), upper stud cover (2), and cup washers (3).

3. Remove entire shock absorber assembly from its mounting studs.

4. Push bushings (4) from shock absorber eyes.

5. Remove retaining ring (5).

6. Compress spring (9) enough to remove split key (6). Tool 97010-52A is available to make this job easy.

7. Release spring pressure, then remove tool.
8. Remaining parts can then be disassembled.

Inspection

Inspect all parts for wear or damage. Pay particular attention to the following items.

1. Check condition of rubber bushings.
2. Check dirt seals carefully.
3. Be sure there is no fluid leakage.
4. To test shock absorber, compare its action with that of a new unit. It should take slightly less effort to compress it than to extend it.

Assembly (1966 and Earlier)

Assembly is essentially the reverse of disassembly. Observe the following notes.

1. Lightly grease the cam sleeve and spring rotating cam.
2. On 1964 and earlier models, slot marked "B" is for right side assembly. Slot "A" is for left side assembly. On 1965 and 1966 models, either slot may be used.
3. On 1964 and earlier models, install shock assemblies on motorcycle so that letters "A" and "B" are to the rear. Shock absorbers may be installed either way on 1965-1966 models.

Assembly (1967 and Later)

Assembly is essentially the reverse of disassembly. Observe the following notes.

1. Lightly grease all surfaces of both cams.
2. Be sure to position cam lobes correctly.

BRAKES

Front wheel brakes on earlier models are of internal expanding type, cable-operated by a lever on the handlebar. Later models are equipped with disc front brakes. Rear brakes on earlier models are of internal expanding type, operated by a foot pedal. Later models are equipped with rear disc brakes.

Front Brake Adjustment

Models with internal expanding brakes require periodic front brake adjustment. Refer to **Figure 20**.

1. Support motorcycle so that front wheel is free to turn.
2. Loosen locknut (3).
3. Turn adjusting sleeve nut (4) until hand lever (1) moves about ¼ of its total travel before brake begins to take effect.
4. Tighten locknut.
5. Spin wheel to be sure brake does not drag. If brake drags with proper adjustment, continue with Steps 6 through 8.
6. Loosen brake shoe pivot stud (5) and axle nut. Do not remove them.
7. Spin wheel. While wheel is spinning, apply front brake, then tighten pivot stud and axle nut.
8. Recheck brake adjustment as specified in Steps 1 through 4.

Rear Brake Adjustment

Models to 1972 are equipped with internal expanding hydraulic rear brakes, which require periodic adjustment. Disc brakes do not require periodic adjustment; it is necessary to adjust rear brake pedals on models with disc brakes, however.

1. Support motorcycle so that rear wheel is free to rotate.
2. Locate adjusting cam nuts on outside of brake side cover. One is at approximately 9 o'clock position and the other at approximately 2 o'clock position.
3. Turn forward (9 o'clock) cam nut counterclockwise until wheel has noticeable drag.
4. Turn wheel forward and backward. This operation centers forward brake shoe.
5. Turn the cam nut clockwise until the wheel turns freely.
6. Repeat Steps 3 through 5 for the remaining cam nut, but turn it clockwise to tighten brake.

Rear Brake Pedal Adjustment (Electra-Glide)

1. Work brake pedal by hand. Note free-play of pushrod before it contacts piston in master cylinder.
2. If not approximately 1/16 in., loosen rear bolt on master cylinder and brake pedal stop bolt.

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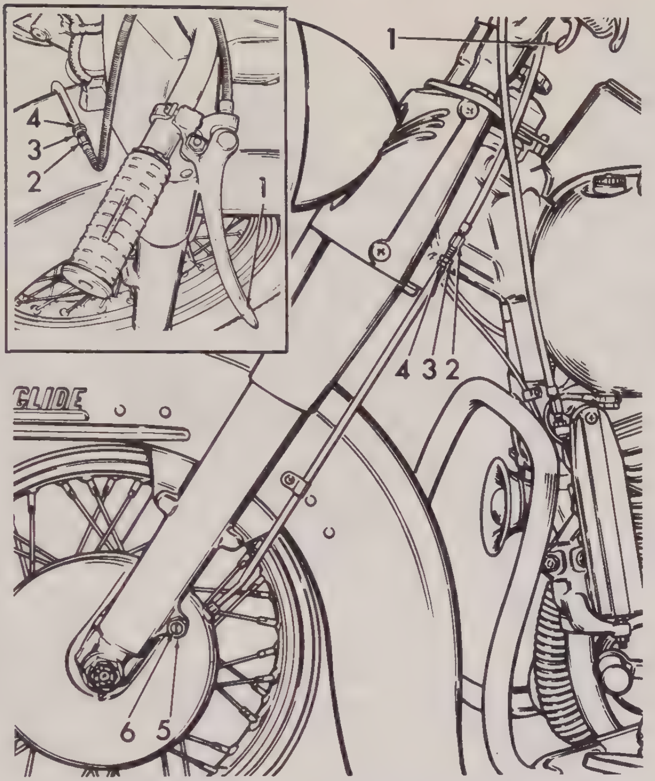

FRONT BRAKE ADJUSTMENT

1. Front wheel brake hand lever
2. Brake adjusting sleeve
3. Adjusting sleeve locknut
4. Adjusting sleeve nut
5. Brake shoe pivot stud nut
6. Brake shoe pivot stud

3. Move front end of plate up or down as required to establish correct play in pushrod.

4. Tighten bolts.

Rear Brake Pedal Adjustment (Late Super Glide)

1. Operate brake pedal by hand. Master cylinder plunger should have approximately 1/16 in. free-play.

2. If not correct, loosen locknut, then turn clevis on brake rod as required.

3. Tighten locknut.

Front Brake Disassembly (1971 and Earlier Electra-Glide)

Figure 21 is an exploded view of this brake. Refer to it during disassembly and service.

1. Remove wheel and brake together.

2. Spring both brake shoes (2) away from brake side cover (23). Springs (1 and 3) will come out with brake shoes.

3. Remove cotter pin (16) to disassemble the remaining parts.

Front Brake Disassembly (1972 and Earlier Super Glide)

Refer to **Figure 22**, then proceed as follows.

1. Remove front wheel and brake.

2. Remove operating shaft nut (2) and brake operating lever (3).

3. Lightly tap end of operating shaft (4) to remove brake assembly from brake side plate (7).

4. Disconnect brake shoe springs (9) to remove brake shoes (8).

Rear Brake Disassembly (1972 and Earlier)

Figure 23 is an exploded view of this brake. Refer to it during disassembly and service.

1. Remove rear wheel.

2. Disconnect spring (1), then remove brake shoes (2 and 3) together with spring (4).

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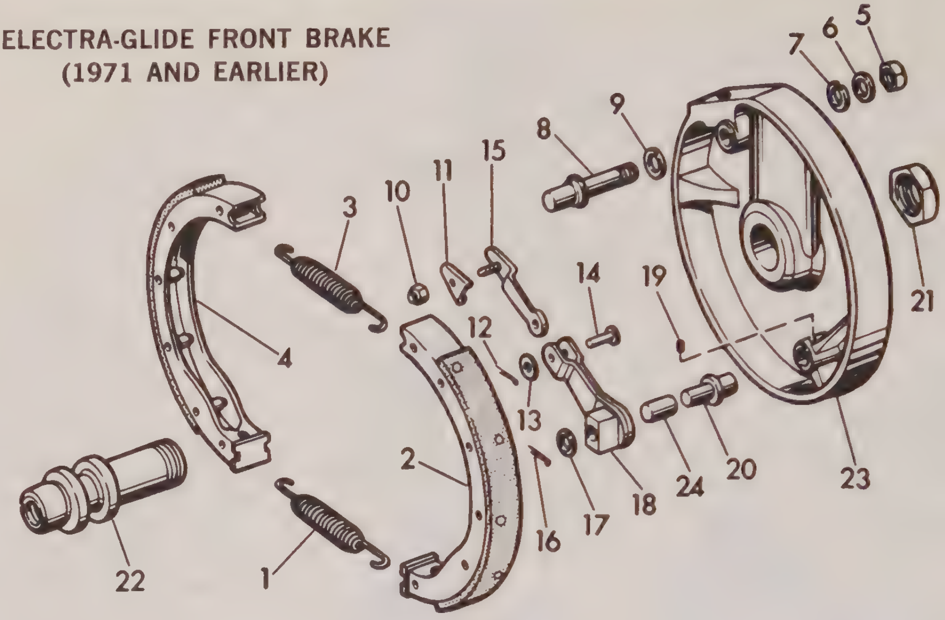
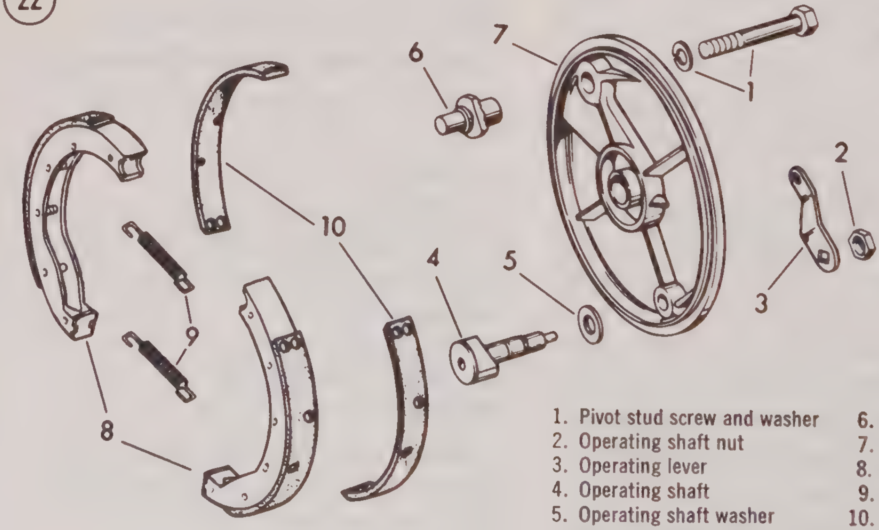
ELECTRA-GLIDE FRONT BRAKE (1971 AND EARLIER)



1. Brake shoe spring
2. Brake shoe and lining
3. Brake shoe spring
4. Brake shoe and lining
5. Brake shoe pivot stud nut
6. Pivot stud flat washer
7. Pivot stud lockwasher
8. Pivot stud
9. Pivot stud washer
10. Clevis clamp nut
11. Cable clevis clamp
12. Cotter pin
13. Flat washer
14. Cam lever clevis pin
15. Cable clevis
16. Cotter pin
17. Cam lever washer
18. Cam lever
19. Set screw
20. Cam lever stud
21. Axle sleeve nut
22. Front axle sleeve
23. Brake side cover
24. Cam lever bushing

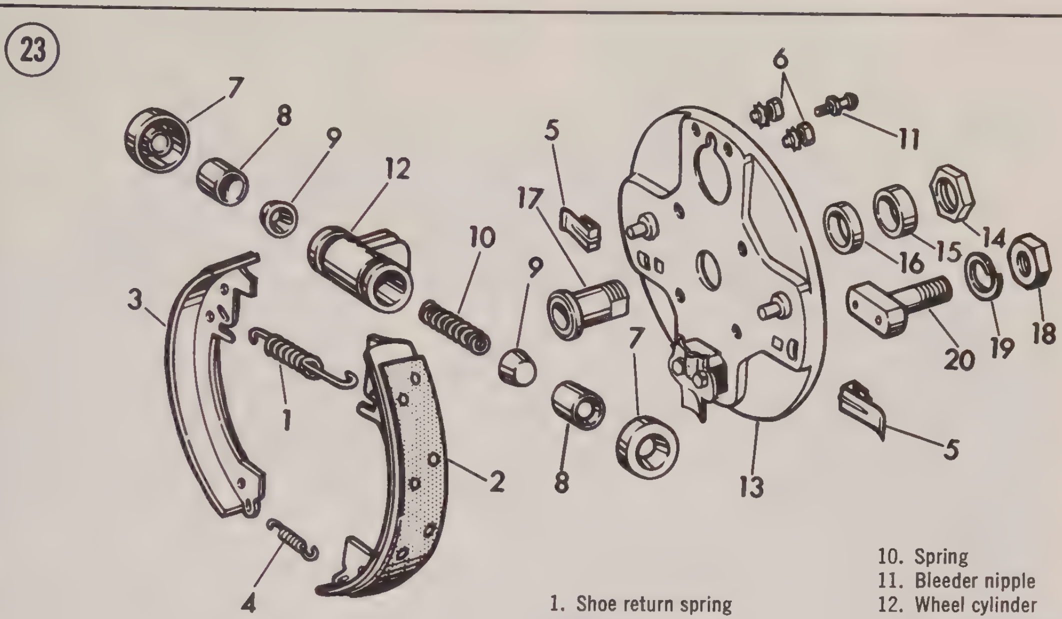
22

SUPER GLIDE FRONT BRAKE (1972 AND EARLIER)



1. Pivot stud screw and washer
2. Operating shaft nut
3. Operating lever
4. Operating shaft
5. Operating shaft washer
6. Shoe pivot stud
7. Brake side plate
8. Brake shoe and lining
9. Brake shoe spring
10. Brake lining

(23)



REAR BRAKE — ALL MODELS (1972 AND EARLIER)

1. Shoe return spring
2. Front brake shoe
3. Rear brake shoe
4. Brake shoe spring
5. Hold-down spring
6. Cylinder screw and lockwasher
7. Boot
8. Piston
9. Cup
10. Spring
11. Bleeder nipple
12. Wheel cylinder
13. Brake side cover
14. Nut
15. Spacer
16. Collar
17. Brake sleeve
18. Nut
19. Lockwasher
20. Anchor stud

3. Remove springs (5).
4. Remove wheel cylinder (12) if necessary, by taking out screws (6).

Brake Inspection

Examine inner surfaces of brake drums for wear or deep grooves. Any groove deep enough to catch a fingernail is enough to impair braking efficiency.

Examine brake linings for oil, grease, or other foreign material. Replace grease or oil-soaked lining immediately. Dirt embedded in brake linings can usually be removed with a wire brush.

Be sure that wheel cylinder on brake shoe does not leak. Overhaul kits are available to repair leaking wheel cylinders.

Brake shoes may be relined. All that is necessary is to remove old rivets, then rivet new linings into place. If shoes are relined, start riveting from one end of lining and work toward the other, to prevent buckling. Be sure to bevel ends of brake lining after installation.

Brake Reassembly

Brake reassembly is essentially the reverse of disassembly. Take care not to touch brake linings or drums with greasy fingers or tools. Be sure to adjust brakes and drive chain (if applicable) after assembly and installation.

NOTE

On rear brakes, wide shoe must be installed toward front of motorcycle and narrow shoe installed to rear.

Disc Brake (1972 FL/FLH and 1975 FX)

Figure 24 is an exploded view of this brake. Refer to that illustration during disassembly and service. It is not necessary to remove wheel if only caliper assembly is to be replaced.

1. Remove hose clamp.
2. Remove all bolts (1) and washers (2).
3. Remove outer caliper half (3).

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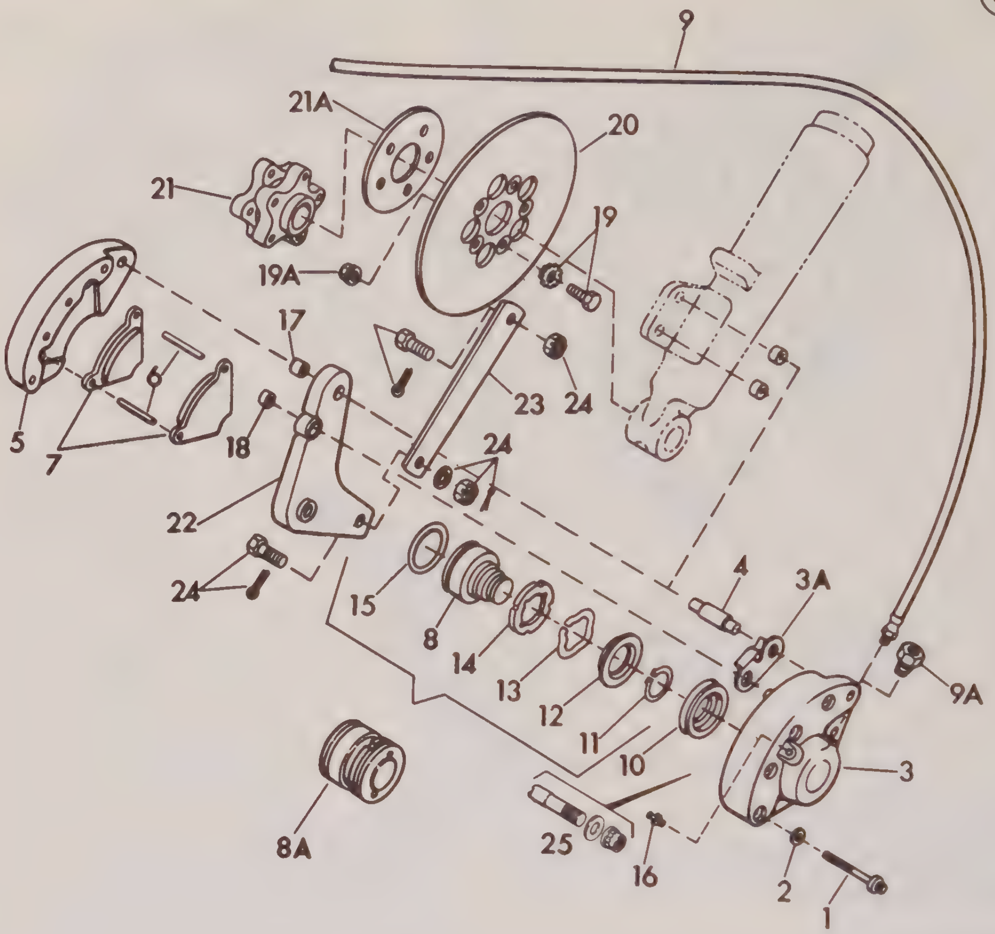


**DISC BRAKE–1972 AND LATER FL;
1975 AND LATER FX**

1.	Bolt
2.	Washer
3.	Outer caliper half
3A.	Damper spring (1973 and later, front only)
4.	Mounting pin
5.	Inner caliper half
6.	Brake pad mounting pins
7.	Brake pads
8.	Brake piston
8A.	Brake piston assembly (front or rear)
9.	Hydraulic line
9A.	Adapter (1973 and later FX)
10.	Piston boot
11.	Retaining ring
12.	Backing plate
13.	Wave spring
14.	Friction ring
15.	O-ring
16.	Bleeder valve
17.	Bushing
18.	Bushing
19.	Bolt and lockwasher
19A.	Nut (1973 and later FL)
20.	Brake disc
21.	Brake disc flange (1972)
21A.	Brake disc spacer (1973 and later FX)
22.	Rear brake mounting bracket (1973 and later)
23.	Rear brake torque arm (1973 and later)
24.	Bolt, castle nut, washer and cotter pin (1973 and later)
25.	Replacement mounting pin

4. Remove damper spring (3A).
5. Remove mounting pin (4), then inner caliper half (5).
6. Remove both brake pads (7) and brake pad mounting pins (6).

Check brake pads for looseness, wear, or damage. Replace both pads if thickness of either is 1/16 in. or less. Be sure that brake pad backing plate is flat. Replace both pads if either backing plate is warped.

NOTE
Always replace brake pads as a set.

Check piston retraction as follows.

1. Mount a dial gauge on back of outer caliper half so that dial gauge plunger is on face of piston.
2. Apply hand brake. With brake applied, set dial indicator to zero.
3. Release the handbrake. If a dial gauge does not indicate the value given in **Table 3** at the end of this chapter, replace the brake piston assembly.

NOTE
Don't remove brake piston assembly unless it exhibits evidence of leakage, or if piston does not operate properly.

To remove piston assembly (8 or 8A), proceed as follows.

1. Operate front brake hand lever until piston moves no farther.
2. Disconnect hydraulic line (9).
3. Remove piston boot (10) from its groove in piston, then pull piston out.
4. Remove snap ring (11).
5. Remove backing plate (12), wave spring (13), adjusting ring (14), and O-ring (15).
6. Remove bleeder valve (16).

Clean all parts, then inspect them carefully. Pay particular attention to the following items.

1. Replace outer caliper half if it is scored.
2. Replace brake disc (20) if it warped more than 0.031 in., badly scored, or worn to less than 0.188 in. thick. When replacing brake disc, torque its retaining bolts (4) to 35 ft.-lb.
3. Replace bushings (17 and 18) if worn.
4. Always replace O-ring (15) and adjusting ring (14) whenever piston is disassembled.
5. Replacement bolt-in mounting pins (25) are available to replace riveted type if replacement is necessary.

Reassembly is essentially the same as disassembly. Observe the following notes.

1. Be sure that all parts exposed to hydraulic fluid are absolutely clean.
2. Dip piston assembly and piston boot in fresh hydraulic fluid before assembly.
3. Install piston boot so that its drain hole is positioned downwards installed on motorcycle.
4. When inserting piston assembly into its bore, keep it square to prevent scoring. Push piston assembly fully into its bore.

NOTE
When replacing brake pads, piston assembly must be pushed fully into its bore to provide proper clearance when calipers are installed.

5. Apply anti-freeze compound to all bolts (1). Torque these bolts to 35 ft.-lb.
6. Turn handlebar to left so that hydraulic reservoir is level. Then fill reservoir to gasket surface.
7. Check system for leaks. Seal leaks at fittings with Loctite.

CAUTION
Do not use any sealant other than Loctite. Other sealants may contaminate the hydraulic system.

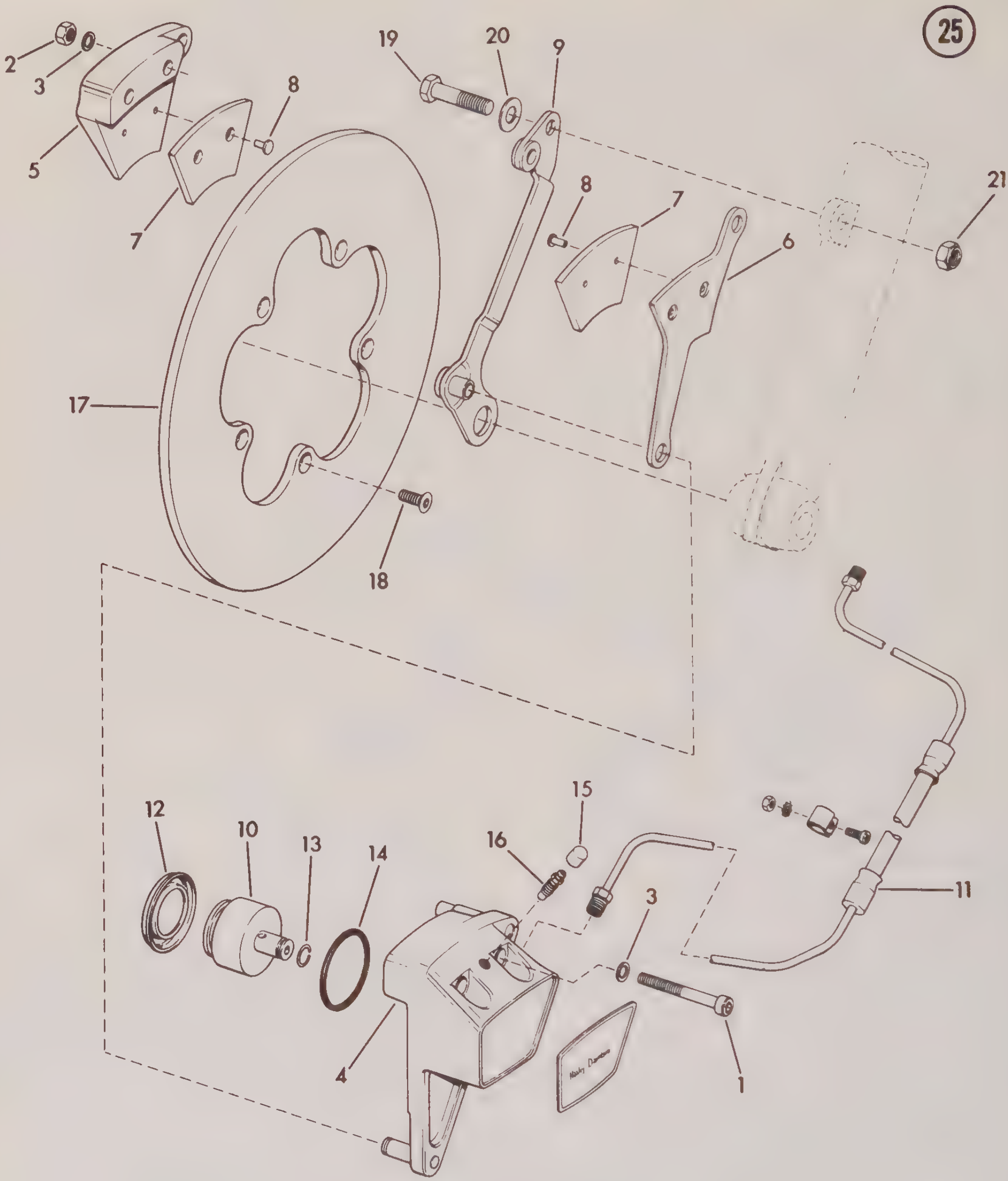
8. Bleed brake. Refer to *Bleeding Hydraulic System.*
9. Check hand lever action whenever installing new ".016F" pistons. The hand lever must *not* bottom against the handlebar. If it does, do not operate the motorcycle until the problem is resolved.

Disc Brake (1974 and Later FX)

Figure 25 is an exploded view of this brake. Refer to that illustration during disassembly and service. It is not necessary to remove front caliper assembly.

1. Remove screw (1), locknuts (2), and washers (3).
2. Separate outer caliper half (4) from inner caliper half (5).
3. Remove pressure plate (6) and outer brake pad (7) together.

(25)



DISC BRAKE–1974 AND LATER FX

1. Socket head screw
2. Locknut
3. Washer
4. Outer caliper half
5. Inner caliper half
6. Pressure plate
7. Brake pad
8. Rivet
9. Torque arm
10. Piston
11. Hydraulic hose
12. Rubber boot
13. Friction ring
14. O-ring
15. Bleeder valve cap
16. Bleeder valve
17. Brake disc
18. Brake disc mounting screw
19. Torque arm mounting bolt
20. Torque arm mounting bolt washer
21. Torque arm mounting bolt locknut

Replace brake pads if they are damaged, loose, or worn down to indicator groove on bottom of pad. Drill out rivets (8) with 9/64 in. drill, then install replacement pads, using hollow rivets.

NOTE: *Replace brake pads only as a set.*

Replace pressure plate (6) if it is warped. Be sure that torque arm bushings (9) are clean.

Push piston (10) all the way into its bore in outer caliper before assembling caliper halves.

Do not remove piston from outer caliper unless leakage exists, or if it doesn't operate properly. To remove piston, proceed as follows.

1. Disconnect hydraulic line (11) at outer caliper half. Plug line to prevent loss of fluid and entry of foreign matter.
2. Remove rubber boot (12).
3. Carefully pry piston from outer caliper half, using 2 screwdrivers.
4. Remove friction ring (13) from piston if it is damaged. If friction ring is OK, it is not necessary to remove it.
5. Remove O-ring (14) from outer caliper half.
6. Remove bleeder valve cap (15) and bleeder valve (16).

Clean all parts in solvent, then inspect them carefully. Take note of the following items.

1. Replace outer caliper half if its cylinder bore is badly scored.
2. Replace brake disc (17) if it is warped more than 0.031 in., badly scored, or worn to less than 0.188 in. thick. If brake disc is replaced, torque its retaining screw (18) to 10 ft.-lb.

Reassembly is essentially the reverse of disassembly. Observe the following notes.

1. Be sure that all parts are clean. In particular, don't touch any part exposed to hydraulic fluid with greasy fingers or tools.
2. Immerse O-ring, piston, and friction ring in clean hydraulic fluid before assembly.
3. When inserting piston, be sure that it is square in its bore. Rotate piston while tapping it into position with a soft mallet. This procedure prevents O-ring damage.
4. Be sure that both lips on boot engage their respective grooves.
5. Torque caliper bolts (1) to 130 in.-lb.
6. Be sure caliper moves freely on torque arm.
7. After connecting hydraulic line to outer caliper half, refill reservoir with brake fluid.
8. If hydraulic line fittings leak, seal them with Loctite.

CAUTION

Do not use any sealant other than Loctite. Other sealants may contaminate hydraulic system.

9. Bleed brakes. Refer to *Bleeding Hydraulic System.*

Front Brake Master Cylinder

Figure 26 is an exploded view of a typical master cylinder. Refer to that illustration during disassembly and service.

1. Remove master cylinder cover retaining screws (4), then master cylinder cover (2), and gasket (3).
2. Disconnect hydraulic line (5) at master cylinder.
3. Remove handlebar switch, then disconnect wiring for stoplight.
4. Pull out pivot pin (7), after removing its retaining ring (6).
5. Remove brake hand lever (8), pin (9), plunger (10), spring (11), washers (12), and dust wiper (13).
6. Remove retaining ring (14).
7. Remove piston (15), O-ring (16), piston cup (17), spring cup (18), and spring (19).

Carefully examine O-ring (16) and piston cup (17) for softening or wear. Be sure that there are no scratches, grooves, or corrosion in bore of master cylinder (1). Gasket (3) must be in good condition. Be sure that vent hole in cover (2) is not plugged. Replace any defective parts if necessary.

Master cylinder assembly is the reverse of disassembly. It is suggested that a repair kit be installed if master cylinder is disassembled. If a kit is installed, be sure to use all new parts, not just those which appear to be worn. Observe the following notes.

1. Lubricate all internal parts with brake fluid before assembly.

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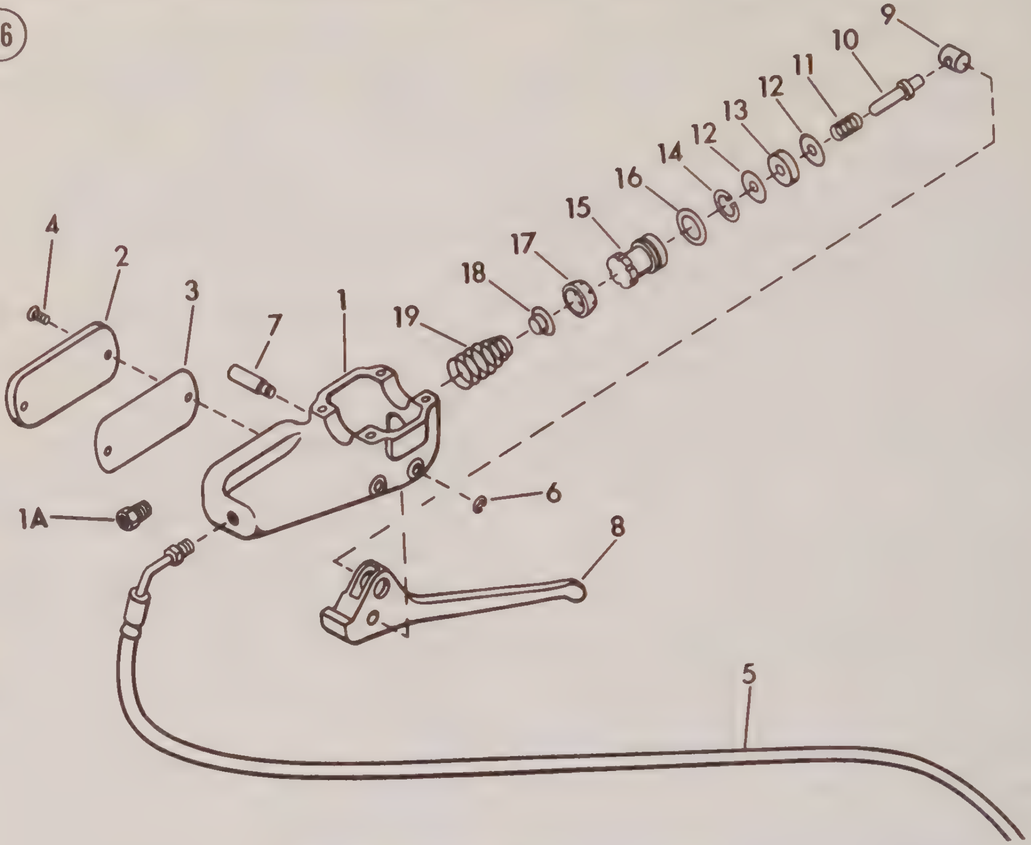

FRONT BRAKE MASTER CYLINDER

1. Master cylinder
1A. Repair fitting
2. Master cylinder cover
3. Gasket
4. Screw
5. Hydraulic line
6. Retaining ring
7. Pivot pin
8. Brake lever
9. Pin
10. Plunger
11. Spring
12. Washer
13. Dust wiper
14. Retaining ring
15. Piston
16. O-ring
17. Piston cup
18. Spring cup
19. Spring

2. Take care not to touch any parts exposed to brake fluid with greasy fingers or tools.

3. Grease pin (9) and pivot pin (7) lightly before assembly.

> NOTE: *Be sure that relief port in master cylinder is uncovered when brake lever is released.*

4. Turn handlebar to left, then fill reservoir with brake fluid.

5. Install master cylinder cover gasket with its flat side down.

6. Install cover.

7. Bleed the front brake. Refer to *Bleeding Hydraulic System*.

Rear Brake Master Cylinder

Rear brake master cylinders are similar for all models. It is not necessary to remove master cylinder if only piston assembly is to be replaced. Refer to **Figure 27**.

1. Remove clevis pin (1).
2. Remove clevis (2) after loosening its locknut (3).
3. Pull out plunger (4).

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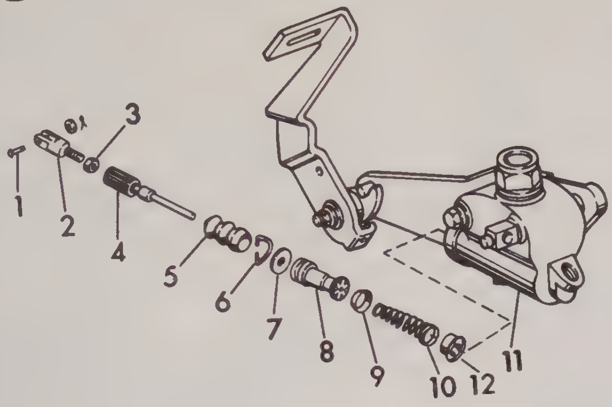


REAR BRAKE MASTER CYLINDER

1. Rod clevis pin with washer and cotter pin
2. Lever clevis
3. Master cylinder plunger locknut
4. Master cylinder plunger
5. Cylinder boot
6. Stop wire
7. Stop washer
8. Piston assembly
9. Piston cup
10. Piston return spring
11. Master cylinder
12. Valve

4. Remove boot (5), stop wire (6), washer (7), piston assembly (8), piston cup (9), spring (10), and valve (12).

> NOTE: *Valve (12) and its seat are not installed in 1973 and later master cylinders. These master cylinders are identified with a paint spot.*

Inspection and service procedures for rear brake master cylinders are similar to those for front brake master cylinders.

Bleeding Hydraulic System

Air enters into the hydraulic system whenever any line or fitting is opened. If this air is not removed, little or no braking action will occur, and the hand lever or pedal will feel "soft."

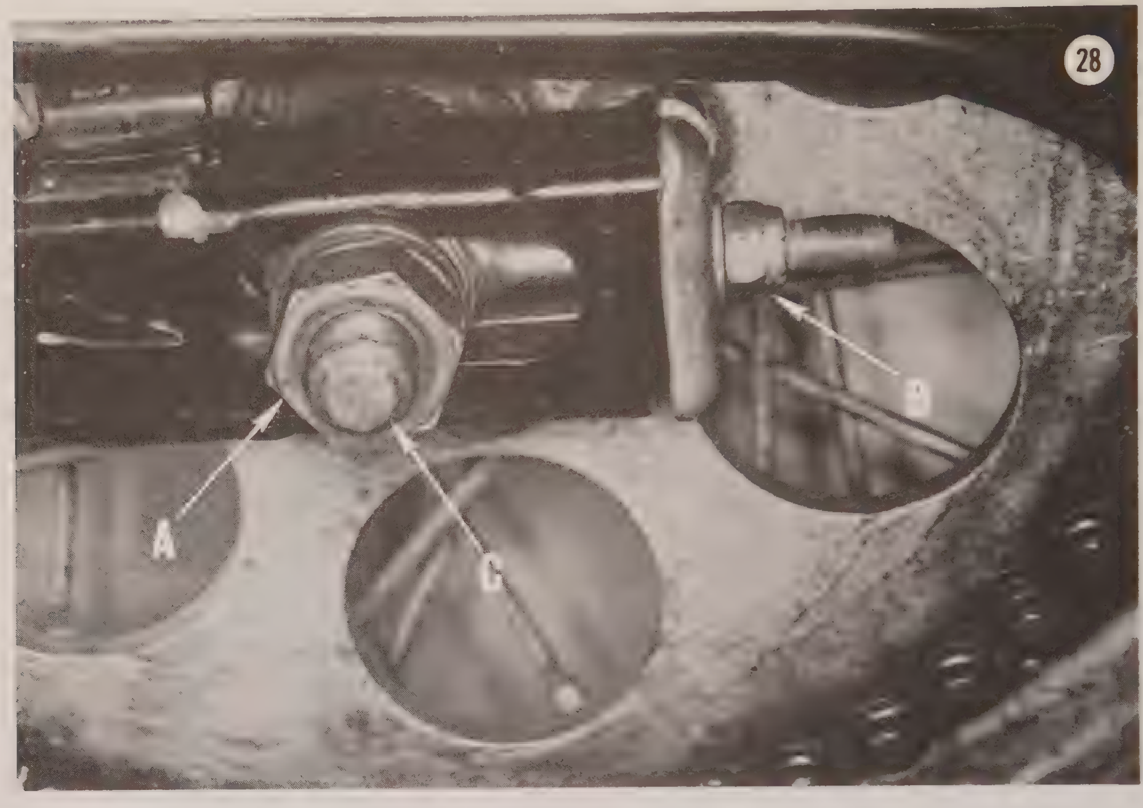
1. Obtain a length of plastic tubing that will just slip over the bleeder valve. Connect one end of this tubing to bleeder valve and submerge the other end in a vessel of fresh brake fluid.
2. On front brakes, turn front wheel to the right, so that bleeder valve is almost vertical.
3. Open bleeder valve about ½ turn.
4. Be sure that master cylinder is full; recheck fluid level frequently during entire bleeding procedure.
5. Slowly operate hand lever or brake pedal throughout its full range. Brake fluid and air bubbles will flow from end of tube each time hand lever or brake pedal is operated. Continue to operate lever or pedal until no more air bubbles appear in brake fluid flowing from tube.
6. Close bleeder valve.
7. Discard used brake fluid.

DRIVE CHAIN

Drive chains are subjected to road dirt and heavy loads. It is important to inspect and adjust the drive chain every 1,000 miles.

Chain Adjustment (1972 and Earlier)

1. Loosen axle nut.
2. Loosen locknut on each side of motorcycle.
3. On late models with anchor bolts, loosen that bolt also.
4. Turn each adjustment stud clockwise to take up slack in chain. To loosen chain, turn each adjustment stud counterclockwise; simultaneously tap each end of axle with a soft mallet to drive wheel forward. Be sure to turn each adjusting nut equally to maintain rear wheel alignment. Adjust as required until lower part of chain moves 1/2 in. up and down.
5. After adjustment, with locknuts tight, distance between outer end of adjusting stud locknut should be equal.
6. Check rear wheel alignment by observing rear tire. It should be midway between rear swinging arms. Also sight forward along chain as



it runs over rear sprocket. It should not appear to bend sideways.

7. Tighten rear axle nut and adjusting stud locknuts.

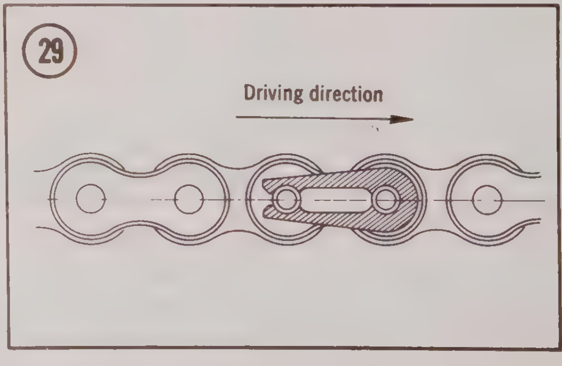
Chain Adjustment (1973 and Later)

Refer to **Figure 28**, then proceed as follows.

1. Remove cotter pin, then loosen brake anchor castellated nut.
2. Loosen axle nut (A).
3. Turn adjusting nuts (B) as required to provide ½ in. vertical play in lower chain run. It will be necessary to tap ends of axle (C) forward if chain is to be loosened.
4. After adjustment, tighten axle nut and brake anchor nut. Be sure to replace cotter pin. Also check rear wheel alignment as described for 1972 and earlier.

Drive Chain Inspection

1. Disconnect master link, then remove drive chain. For models with press-fitted side plates on master links, Tool 95020-38 is available.
2. Clean chain thoroughly with solvent and a stiff bristle brush.
3. Lay chain on a flat surface, then push all links together so chain is at its shortest length. Measure and record its length.
4. Stretch chain to remove all slack between links. Again measure its length.
5. If there is one inch or more between measurements obtained in Steps 3 and 4, replace chain. Also replace chain if there are any cracked rollers, stiff links, kinks, or other visible irregularities.



6. Lubricate chain before installation, using a good chain lubricant. Follow instructions on its container.

7. When replacing master link, be sure that its clip is installed as shown in **Figure 29**.

Chain Oiler

Inspect chain oiler every 1,000 miles. If chain does not appear to be receiving enough oil, clean and adjust chain oiler.

1. Back out locknut (if applicable).
2. Turn adjustment screw in until it seats lightly. Count and record number of turns required.
3. Remove adjusting screw by turning it out completely.
4. Blow out foreign material from chain oiler orifice with compressed air.
5. Replace adjusting screw, then turn it in until it seats lightly.
6. Back out adjusting screw amount recorded in Step 2.
7. Oil should flow at approximately 2 to 3 drops per minute. This flow rate should occur when screw is backed out about ¼ turn.

SOLO SADDLE SEAT

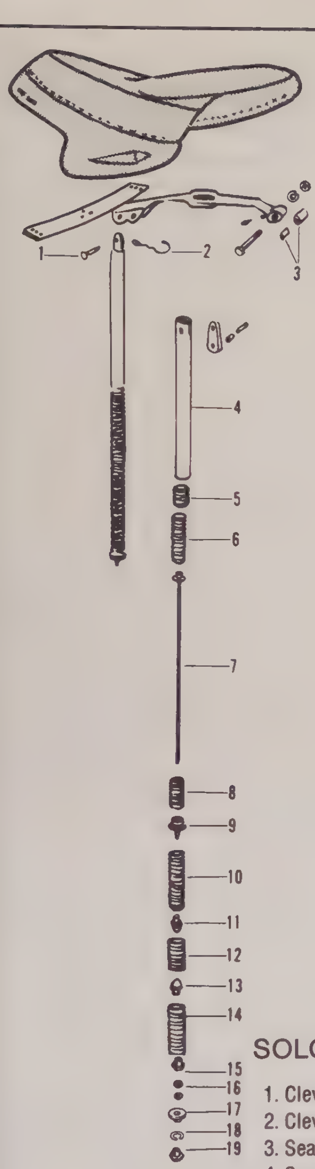
Solo Saddle

The solo seat is designed for rider weight of up to 220 lb. An optional heavy spring set is also available. The heavy set has the letter "D" stamped on the seat post plunger. See **Figure 30**.

For proper operation, the spring adjusting nut should be positioned to show 11 in. of spring below the bottom of the seat post plunger (10-1/2 in. with the heavy "D" springs).

The bottom of the seat post rod should extend 3/4 in. below the seat post rod nut, so that the rod locknut can be installed from below the seat post frame tube.

An occasional greasing of the spring assembly will assure smooth operation.



(30)

SOLO SEAT

1. Clevis pin
2. Clevis pin spring
3. Seat bar bushings
4. Seat post plunger
5. Auxiliary spring (2-3/4 in.)
6. Auxiliary spring (2-3/4 in.)
7. Seat post rod
8. Auxiliary spring (2-3/4 in.)
9. Plunger locknut
10. Cushion spring (5-1/8 in.)
11. Guide collar
12. Cushion spring (2-13/16 in.)
13. Guide collar (2)
14. Cushion spring (5-1/8 in.)
15. Spring adjusting nut
16. Locknut (2)
17. Seat post rod nut
18. Rod locknut washer
19. Rod locknut

Table 3 CALIPER PISTON RETRACTION

Caliper	Piston Mark	Retraction
Front	F	0.020-0.025 in.
Front	MF	0.026-0.031 in.
Front	.016F	0.016-0.018 in.
Rear	R	0.033-0.038 in.

CHAPTER EIGHT

TROUBLESHOOTING

Diagnosing motorcycle ills is relatively simple if you use orderly procedures and keep a few basic principles in mind.

Never assume anything. Don't overlook the obvious. If you are riding along and the bike suddenly quits, check the easiest, most accessible problem spots first. Is there gasoline in the tank? Is the gas petcock in the ON or RESERVE position? Has a spark plug wire fallen off? Check the ignition switch. Sometimes the weight of keys on a key ring may turn the ignition off suddenly.

If nothing obvious turns up in a cursory check, look a little further. Learning to recognize and describe symptoms will make repairs easier for you or a mechanic at the shop. Describe problems accurately and fully. Saying that "it won't run" isn't the same as saying "it quit on the highway at high speed and wouldn't start," or that "it sat in my garage for three months and then wouldn't start."

Gather as many symptoms together as possible to aid in diagnosis. Note whether the engine lost power gradually or all at once, what color smoke (if any) came from the exhaust, and so on. Remember that the more complex a machine is, the easier it is to troubleshoot because symptoms point to specific problems.

You don't need fancy equipment or complicated test gear to determine whether repairs can be attempted at home. A few simple checks could save a large repair bill and time lost while the bike sits in a dealer's service department. On the other hand, be realistic and don't attempt repairs beyond your abilities. Service departments tend to charge heavily for putting together a disassembled engine that may have been abused. Some won't even take on such a job–so use common sense, consider your capabilities; don't get in over your head.

OPERATING REQUIREMENTS

An engine needs 3 basics to run properly: correct gas/air mixture, compression, and a spark at the right time. If one or more are missing, the engine won't run. The electrical system is the weakest link of the 3. More problems result from electrical breakdowns than from any other source. Keep that in mind before you begin tampering with carburetor adjustments and the like.

If a bike has been sitting for any length of time and refuses to start, check the battery for a charged condition first, and then look to the gasoline delivery system. This includes the tank, fuel petcocks, lines, and the carburetors. Rust may have formed in the tank, obstructing fuel flow. Gasoline deposits may have gummed up carburetor jets and air passages. Gasoline tends to lose its potency after standing for long periods. Condensation may contaminate it with water. Drain old gas and try starting with a fresh tankful. Drain carburetor bowls too.

Compression or the lack of it usually enter the picture only in the case of older machines. Worn or broken pistons, rings, and cylinder bores could prevent starting. Generally a gradual power loss and harder and harder starting will be readily apparent in this case.

STARTING DIFFICULTIES

Check gas flow first. Remove the gas cap and look into the tank. If gas is present, pull off a fuel line at the carburetor and see if gas flows freely. If none comes out, the fuel tap may be shut off, blocked by rust or foreign matter, or the fuel line may be stopped up or kinked. If the carburetor is getting usable fuel, turn to the electrical system next.

Check that the battery is charged by turning on the lights or by beeping the horn. Refer to your owner's manual for starting procedures with a dead battery. Have the battery recharged if necessary.

Pull off a spark plug cap, remove the spark plug, and reconnect the cap. Lay the plug against the cylinder head so its base makes a good connection, and turn the engine over with the kickstarter. A fat, blue spark should jump across the electrodes. If there is no spark, or only a weak one, there is electrical system trouble. Check for a defective plug by replacing it with a known good one. Don't assume a plug is good just because it's new.

Once the plug has been cleared of guilt, but there's still no spark, start backtracking through the system. If the contact at the end of the spark plug wire can be exposed, it can be held about ⅛ in. from the head while the engine is turned over to check for a spark. Remember to hold the wire only by its insulation to avoid a nasty shock. If the plug wires are dirty, greasy, or wet, wrap a rag around them so you don't get shocked. If you do feel a shock or see sparks along the wire, clean or replace the wire and/or its connections.

If there's no spark at the plug wire, look for loose connections at the coil and battery. If all seems in order there, check next for oily or dirty contact points. Clean points with electrical contact cleaner, or a strip of paper. With battery ignition switch turned on, open and close the points manually with a screwdriver.

No spark at the points with this test indicates a failure in the ignition system. Refer to Chapter Five (*Electrical System*) for checkout procedures for the entire system and individual components. Refer to Chapter Two for checking and setting ignition timing.

Note that spark plugs of the incorrect heat range (too cold) may cause hard starting. Set gaps to specifications. If you have just ridden through a puddle or washed the bike and it won't start, dry off plugs and plug wires. Water may have entered the carburetor and fouled the fuel under these conditions, but wet plugs and wires are the more likely problem.

If a healthy spark occurs at the right time, and there is adequate gas flow to the carburetor, check the carburetor itself at this time. Make sure all jets and air passages are clean, check float level, and adjust if necessary. Shake the float to check for gasoline inside it, and replace or repair as indicated. Check that the carburetors are mounted snugly, and no air is leaking past the manifold. Check for a clogged air filter.

Compression may be checked in the field by turning the kickstarter by hand and noting that adequate resistance is felt, or by removing a spark plug and placing a finger over the plug hole and feeling for pressure. Refer to Chapter Two for details on performing an engine compression test.

POOR IDLING

Poor idling may be caused by incorrect carburetor adjustment, incorrect timing, or ignition system defects. Check the gas cap vent for an obstruction.

MISFIRING

Misfiring can be caused by a weak spark or dirty plugs. Check for fuel contamination. Run the machine at night or in a darkened garage to check for spark leaks along the plug wires and under the spark plug cap. If misfiring occurs only at certain throttle settings, refer to the carburetor chapter for the specific carburetor circuits involved. Misfiring under heavy load, as when climbing hills or accelerating, is usually caused by bad spark plugs.

FLAT SPOTS

Poor condition of valves, rings, pistons, or cylinders will cause a lack of power and speed. Ignition timing should be checked.

OVERHEATING

If the engine seems to run too hot all the time, be sure you are not idling it for long periods. Air-cooled engines are not designed to operate at a standstill for any length of time. Heavy stop and go traffic is hard on a motorcycle engine. Spark plugs of the wrong heat range can burn pistons. An excessively lean gas mixture may cause overheating. Check ignition timing. Don't ride in too high a gear. Broken or worn rings may permit compression gases to leak past them, heating heads and cylinders excessively. Check oil level and use proper grade lubricants.

BACKFIRING

Check that timing is not advanced too far. Check fuel for contamination.

ENGINE NOISES

Experience is needed to diagnose accurately in this area. Noises are hard to differentiate and harder yet to describe. Deep knocking noises usually mean bearing failure. A slapping noise generally comes from loose pistons. A light knocking noise during acceleration may be bad connecting rod bearing. Pinging, which sounds like marbles being shaken in a tin can, is caused by ignition advanced too far or gasoline with too low an octane rating. Pinging should be corrected immediately or damage to pistons will result. Compression leaks at the head-cylinder joint will sound like a rapid on and off squeal.

PISTON SEIZURE

Piston seizure is caused by incorrect piston clearances when fitted, fitting rings with improper end gap, too thin an oil being used, incorrect spark plug heat range, or incorrect ignition timing. Overheating from any cause may result in seizure.

EXCESSIVE VIBRATION

Excessive vibration may be caused by loose motor mounts, worn engine or transmission bearings, loose wheels, worn swinging arm bushings, a generally poor running engine, broken or cracked frame, or one that has been damaged in a collision. See also *Poor Handling*.

CLUTCH SLIP OR DRAG

Clutch slip may be due to worn plates, improper adjustment, or glazed plates. A dragging clutch could result from damaged or bent plates, improper adjustment, or even clutch spring pressure.

POOR HANDLING

Poor handling may be caused by improper tire pressures, a damaged frame or swinging arm, worn shocks or front forks, weak fork springs, a bent or broken steering stem, misaligned wheels, loose or missing spokes, worn tires, bent handlebars, worn wheel bearing, or dragging brakes.

BRAKE PROBLEMS

Sticking brakes may be caused by broken or weak return springs, improper cable or rod adjustment, or dry pivot and cam bushings. Grabbing brakes may be caused by greasy linings which must be replaced. Brake grab may also be due to out-of-round drums or linings which have broken loose from the brake shoes. Glazed linings or glazed brake pads will cause loss of stopping power.

LIGHTING PROBLEMS

Bulbs which continuously burn out may be caused by excessive vibration, loose connections that permit sudden current surges, poor battery connections, or the wrong type bulb.

A dead battery or one which discharges quickly may be caused by a faulty generator or rectifier. Check for loose or corroded terminals. Shorted battery cells or broken terminals will keep a battery from charging. Low water level will decrease a battery's capacity. A battery left uncharged after installation will sulphate, rendering it useless.

A majority of light and horn or other electrical accessory problems are caused by loose or corroded ground connections. Check those first, and then substitute known good units for easier troubleshooting.

TROUBLESHOOTING GUIDE

The following "quick reference" guide summarizes the troubleshooting process. Use it to outline possible problem areas, then refer to the specific chapter or section involved.

Steering Problems

1. *Hard steering*—Tire pressure, steering damper adjustment, steering stem head, and steering head bearings.
2. *Pulls to one side*—Unbalanced shock absorbers, drive chain adjustment, front/rear wheel alignment, unbalanced tires, defective swinging arm, and defective steering head.
3. *Shimmy*—Drive chain adjustment, loose or missing spokes, deformed rims, worn wheel bearings, and wheel balance.

Loss of Power

1. *Poor compression*—Piston rings and cylinder, head gaskets, misadjusted valves, and burned valves.
2. *Overheated engine*—Lubricating oil supply, oil pump, clogged cooling fins, ignition timing, slipping clutch, and carbon deposits in combustion chamber.
3. *Improper mixture*—Dirty air cleaner, gas cap vent hole, and restricted fuel flow.
4. *Miscellaneous*—Dragging brakes, tight wheel bearings, defective chain, clogged exhaust system, and broken throttle cable.

Gearshifting Difficulties

1. *Clutch*—Adjustment, springs, friction plates, and steel plates.
2. *Transmission*—Oil quantity, oil grade, bent shifter forks, bent shifter rod, worn or bent teeth on dog clutches, worn shifter pawls, and worn shifter cam.

Brake Troubles

1. *Poor brakes*—Brake adjustment, brake shoes not centered, oil or water on brake linings, loose linkage or cables, worn brake lining, low brake fluid level, and air in hydraulic system.
2. *Noisy brakes*—Worn or scratched lining, scratched brake drums, and dirt in brakes.
3. *Unadjustable brakes*—Worn linings, worn drums, and worn brake cams.

NOTE: If you own a 1976 or later model, first check the Supplement at the back of the book for any new service information.

CHAPTER NINE

PERFORMANCE

For nearly five decades, the name Harley-Davidson was synonymous with high performance in motorcycle racing and touring. Even Harley's long-time rival, Indian, eventually bit the dust as the big Milwaukee V-twins increasingly gained ownership of the roads and race tracks.

But like American automobile manufacturers, Harley was slow to create innovative new designs and instead stuck by that particularly Yankee credo that there is no substitute for cubic inches–unless it is more cubic inches.

Times have changed and Harley's time has come and all but gone. Sophisticated, efficient, and lightweight imports have taken over road racing, off-road racing, and touring, and even now are knocking on Harley's doors to professional dirt-track racing and large displacement drag racing.

It's not surprising, then, that there is a great interest today among Harley enthusiasts in regaining some of the marque's performance reputation. It's fortunate for Harley owners that few if any makes have enjoyed the loyalty Harley has received through the years from enthusiasts and performance specialists. At present, there is a wide range of highly developed, quality performance components available to the 74 and 80 owner, whether his interest is in improving the touring performance of a full dresser or taking a crack at the single-engine top-fuel drag record. And there are a lot of stops in between these two extremes.

One of the nicest things about increasing the performance of a Harley motor is that it isn't done at the expense of reliability and long service life. Increased horsepower is achieved through more efficient design of intake and exhaust tracts, valve train, cylinders and pistons, and lower end. As the engine is modified to produce more power, it is also altered and improved to accept the increased loads that are created by more power. It's not uncommon for a highly modified big-inch motor to be as dependable as a stocker.

Chassis improvements for the Harley aren't so easily obtained. The bike is heavy and has very little ground clearance. As a result, it is not possible to make it a good performer for running at high speed on twisty roads. There are some things that can be done to the suspension that will help a strong, modified Harley work better at what it does best–quick, straight-line acceleration. It's possible, too, to make a touring dresser ride more comfortably and decrease rider fatigue on long trips. As limited as they are, chassis improvements should be considered along with engine performance improvements. Suspension and brakes that are adequate for the performance of a stock motor will be terribly lacking, even unsafe, when additional horses make things happen more quickly.

PLANNING PERFORMANCE IMPROVEMENT

To achieve a satisfying modified motorcycle, you must plan your performance work. Determine what you want from your bike and be realistic about how it will be used. For instance, if you count on it to get you to work and back, reliability and liveability–easy starting, good in-traffic performance, low maintenance–are important requirements. If your bike is a toy that is used for weekend fun, these factors may not be as important as strong street performance. And if you are serious about drag racing or top-end Bonneville performance you should be prepared to part willingly with a great deal of money and spend countless hours to keep the motor in top tune and mechanical condition.

If you are just beginning with a stock motor, it's recommended that you first carry out the few simple modifications described below (see *Getting the Most From Stock*). They are inexpensive and easily done and will be valid later if you continue on to major modifications in displacement, headwork, and valve train.

GETTING THE MOST FROM STOCK

A few hours work and a little money can make a world of difference in the performance of a stock 74 or 80. The work described can be carried out with simple hand tools, a little machining, and readily available parts.

M-Series Linkert Carburetor

The M-74B carburetor used on pre-1966 models is a simple, reliable unit, but it does not respond well to modifications. For a stock or very mild street motor it works reasonably well; just don't expect it to add much to performance once you begin to incorporate major engine modifications. If your carburetor is an M-series other than the M-74B, you can improve it by exchanging the venturi-spray bar assembly with the assembly from an M-74B, available through most dealers.

1966 HD Carburetor

The 1966 HD carburetor, often called the Sportster Linkert, can be marginally improved for stock and mild street motor applications. But don't expect it to perform like the S&S high-performance MGL that was based on it.

1. Refer to Chapter Five, *Model DC Carburetor*, and remove, disassemble, clean, and inspect the carburetor as described.
2. Have the carburetor venturi bored to 1-1/2 in. by a competent machine shop and replace the original throttle butterfly with a 1-1/2 in. butterfly obtained from a Harley dealer.
3. Buy a complete "tickler" assembly for an Amal Monobloc carburetor. They are available from shops that handle British bike parts (Triumph, BSA, Norton, etc.) or by mail from British Marketing (see *Sources* list at the end of this chapter). The assembly part No. is 622/172.

Measure the diameter of the tickler shaft and drill a matching size hole in the center of the top of the carburetor float bowl. Braze a small washer to the bottom side of the inside nut that holds the tickler in the float bowl (this washer is necessary to prevent the tickler return spring from falling into the float chamber). Install the tickler assembly in the float bowl (**Figure 1**). Remove the choke assembly from the air cleaner and use a foam-type air cleaner element such as Filtron or K&N. The tickler takes the place of the restrictive choke in that when it is held down for 5-10 seconds prior to starting the engine it

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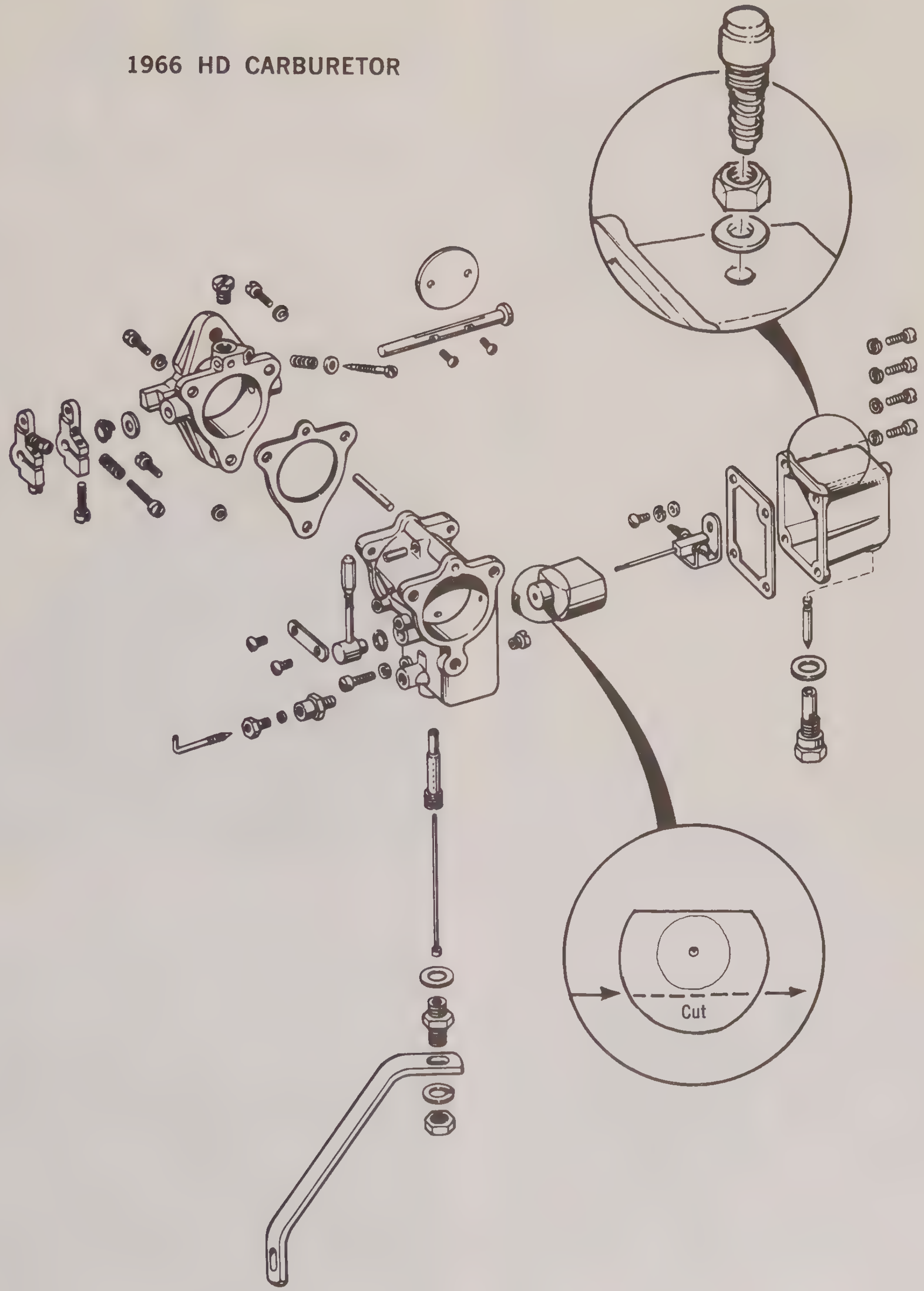
1966 HD CARBURETOR



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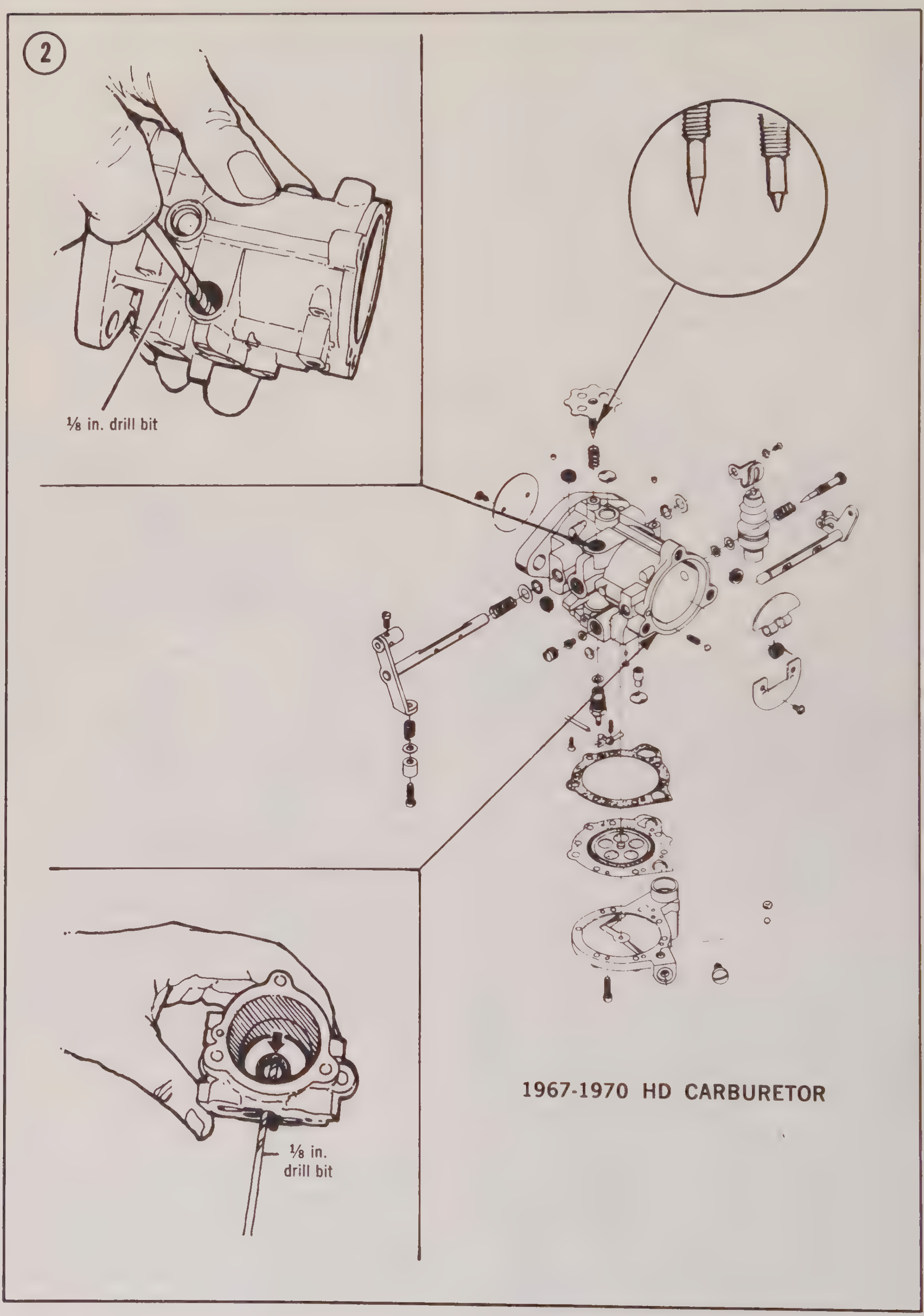
⅛ in. drill bit
⅛ in.
drill bit

1967-1970 HD CARBURETOR

provides the starting circuit with a fuel-rich mixture.

4. Remove the cylindrical portion of the bottom of the float, with a hacksaw, so that the bottom of the float matches the top (**Figure 1**). This increases the capacity of the float bowl and decreases lag in throttle response.

5. Assemble, install, and adjust the carburetor as described in Chapter Five.

1967-1970 HD (Tillotson) Carburetor

The HD Tillotson carburetor used on 1967-1970 models is commonly considered to be fussy and a poor performer that's unresponsive to modifications. Such is not the case; with a little care and some simple modifications the Tillotson can be made to perform very well and at a fraction of the cost of a new high-performance carburetor.

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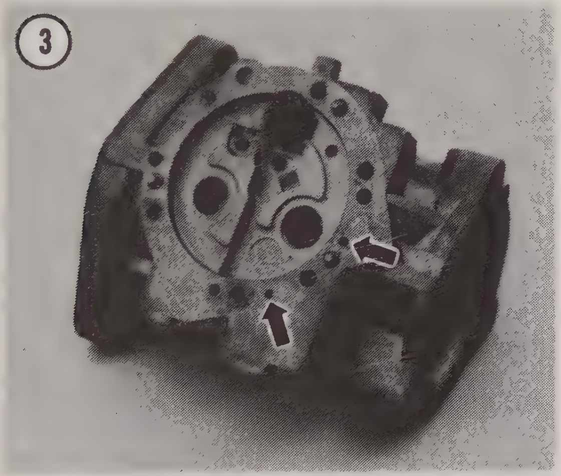

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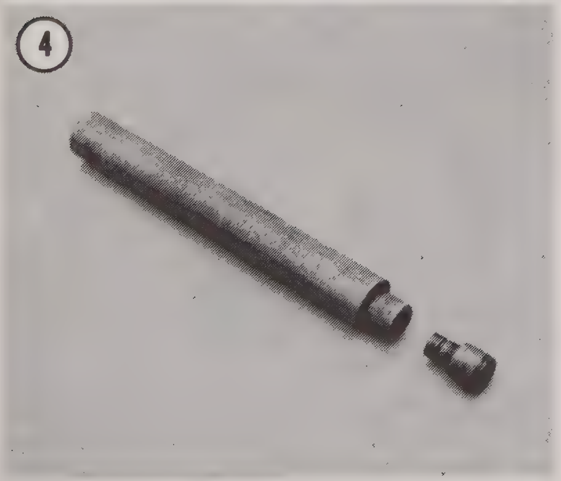

First, make sure you have the correct model Tillotson. It will have "HD-1" stamped on the body. Any other models, such as the HD-2 which is designed for the Sportster, are not suitable. If the carburetor is not an HD-1 you might consider replacing it with a high-performance carburetor at this point. However, if it is an HD-1, read on.

1. Refer to Chapter Five and remove, disassemble, clean, and inspect the carburetor as described (see *1967-1970 HD Carburetor*). Examine the idle adjustment screw to see if it is the later model screw with a double taper (**Figure 2**). If it is an early single-taper screw, carefully inspect the screw seat in the carburetor body for damage. This occurs when the single-taper screw is run in too far. If the seat is severely damaged, smooth idling probably cannot be achieved and the carburetor should be replaced. If the seat is in good condition, replace the single-taper screw with a double-taper screw and continue.

2. Have the caruretor venturi bored to 42-44mm by a competent machine shop and fit it with a new, correctly sized throttle butterfly (available from Harley dealers).

3. Clean the two passages shown in **Figure 3** with fine wire. These passages become clogged with fine grit that can't be removed with air pressure. Their sizes are not critical so there is no danger that the wire will damage them. But if they are not opened there is no way the carburetor can perform satisfactorily.

4. Remove the Welch plug from the main nozzle check valve bore. Using the HD tool shown in **Figure 4**, press out the check valve. (This inexpensive tool is available from Harley dealers.)

5. Drill through the top of the low-speed venturi (the "bombsight") with a 1/8-in. drill. This improves gas flow to the low-speed venturi and will improve starting.

6. Examine the main nozzle check valve to make sure it is the correct one. Tillotson motorcycle carburetors are occasionally fitted with a check valve intended for a Tillotson

snowmobile carburetor, like the one shown in **Figure 5**. This incorrect check valve has a thick wall and a small opening which restricts fuel flow. It must be replaced with the correct valve. Install the valve using the HD tool and install a new Welch plug.

7. Replace the stock fuel inlet pipe with a straight section of 1/8-in. pipe thread tubing. This will improve gas flow to the carburetor.
8. Install an adjustable main jet (**Figure 6**). This part is available through most dealers and the suppliers shown in the *Sources* list at the end of this chapter. After assembling and installing the carburetor, adjust it as described under *Jetting* in this chapter.

Many Harley owners have experienced trouble when the diaphragm in the Tillotson carburetor fails and the crankcase fills with gas. Usually, the diaphragm fails because it becomes brittle. This happens when the bike sits for a long time with the fuel valve closed. The fuel beneath the diaphragm evaporates and the diaphragm dries out. If you begin with a fresh diaphragm and leave the fuel valve open, the chance of this happening is greatly decreased.

However, if the diaphragm fails and the crankcase fills with gas the situation can be simply corrected. First, disconnect the oil return line from the oil tank and drain the gas and oil into a drip pan or bucket. Add two quarts of fresh oil to the tank, start the engine and allow it to run for about a minute, until the fresh oil has carried out any remaining gas into the drip pan. Then, reconnect the return line to the tank and fill the tank with the correct amount of fresh oil. After an hour of running, change the oil again to ensure that all of the gas has been removed from the engine lubrication system.

If the contaminated oil is allowed to remain in the system and the bike is ridden for even a short distance with gas in the lower end, the engine is likely to be severely damaged and require an expensive, complete rebuild.

Bendix 16P12 Carburetor

If your Harley is equipped with an original-equipment Bendix 16P12 carburetor,

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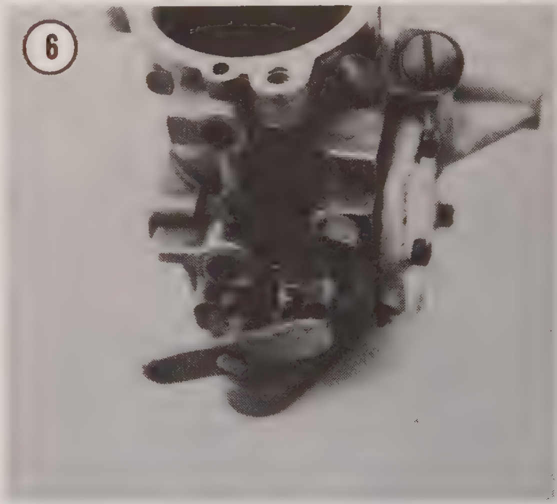

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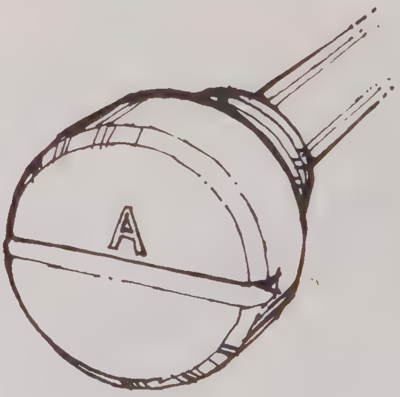

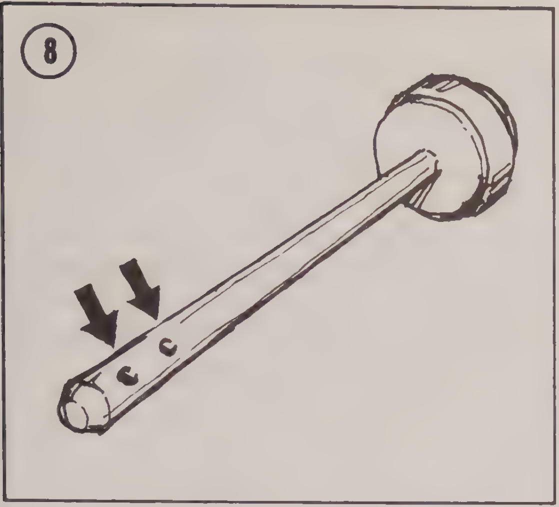
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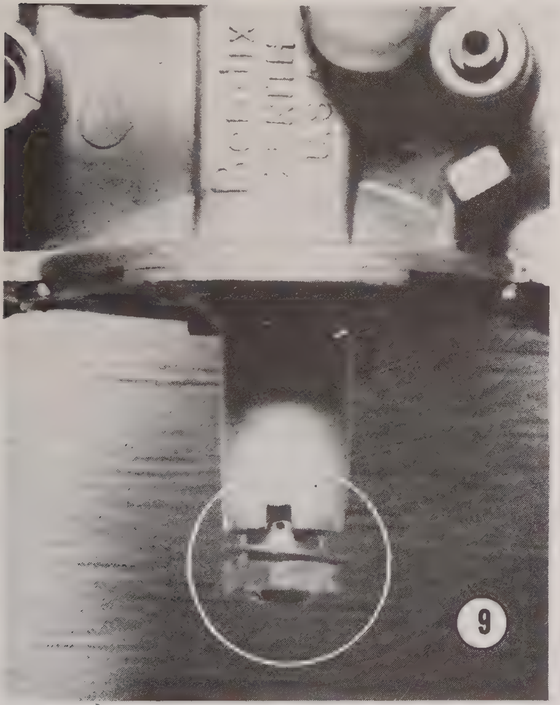
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the following modifications will make it perform much better.

1. Remove, disassemble, clean, and inspect the carburetor as described in Chapter Five, *Model 16P12 Carburetor.*
2. Check the idle tube to see if it is stamped with an "A" and if it is not, replace it with an A-size tube (**Figure 7**).
3. Replace the standard fixed main jet with an adjustable main jet available from Andrews (see *Sources* list at the end of this chapter). This main jet simplifies tuning the Bendix carburetor (see *Jetting* in this chapter).
4. If the carburetor is equipped with a one-hole accelerator pump shaft, replace it with a later two-hole shaft (**Figure 8**). When assembling the carburetor, set the pin in the top hole to provide a tuning starting point. During tuning, if the engine "blubbers" when the throttle is opened wide from midrange, move the pin to the lower hole to shorten the length of the pump stroke. This will decrease the amount of raw fuel that the pump injects into the venturi and should eliminate blubbering.
5. Install the main jet holder in the carburetor and check the alignment of the four holes in the main jet with the notches in the cone of the carburetor body (**Figure 9**). The holes should be centered in the notches. If they are not, remove the main jet holder and carefully widen the notches in the cone with a small file. Reinstall the jet holder and check the alignment of the notches and the holes. It may be necessary to do this several times until the holes are exposed in the notches.
6. With a drill bit, turned by hand, carefully increase the size of the gas inlet port to improve flow.

Keihin Carburetor

The Keihin carburetor that is standard equipment on later models is excellent for stock motors. It makes the motor easy to start, performs well from idle through top end, requires no fiddling to keep it in tune, and delivers good mileage. Unless you are planning extensive engine modifications, the Keihin will provide good performance-unmodified.

Additional Fuel System Modifications

No matter which carburetor is used, or how it's modified, performance will be poor if the carburetor doesn't receive sufficient fuel from the tank.

1. Make sure the gas tank is adequately vented. Gas caps on some accessory tanks

completely seal the tank rather than vent it. As a result, a vacuum develops in the tank and completely shuts off the fuel supply. In such case it may be necessary to drill a small hole in the cap or install a vented cap.

2. When replacing the fuel line from the tank to the carburetor, make certain the ID of the new line is at least as large as the ID of the stock line.
3. If you substitute a small accessory tank for the stock one, fit it with the stock gas tap or a high-flow aftermarket tap. Often, a new tank is fitted with a small tap that is not capable of flowing enough fuel for even a stock motor. As a result, the engine runs fuel-starved under high load.
4. Install an inline filter in the gas line to prevent contaminants from entering the carburetor. Foreign matter and moisture can clog small fuel jets and air passages and defeat even the most careful and patient tuning and modification work. The Fram G-12 is an excellent filter that can be purchased through many dealers and automotive parts stores.

Panhead Manifold Modification

The Tee intake manifold on panhead (pre-1965) motors can be simply modified to improve intake flow and reduce the tendency of one cylinder to steal intake charge from the other.

1. Measure the ID of the manifold (**Figure 10**).
2. Select a piece of aluminum bar stock with an OD equal to the ID of the manifold. Radius the ends of the bar stock with a mill or grinder (**Figure 11**). Chamfer the edges of the piece in preparation for welding.
3. Heliarc the piece into the manifold. Grind the weld bead smooth to provide a good flow path (**Figure 12**).

ENGINE MODIFICATIONS

Engine modifications can range all the way from updating an early model to constructing a record breaker. Experience shows that money is the only factor that controls the extent to which an engine can be modified.

Even the seemingly simple task of updating a panhead motor to shovelhead configuration is not cheap because stock parts are as costly as the high-performance pieces. A competitive drag bike motor can easily cost as much as a new motorcycle.

There is another "cost" for building a high-performance motor and, like money, it is also related to the degree of modification involved. This cost takes the form of increased maintenance and poor liveability that was discussed earlier.

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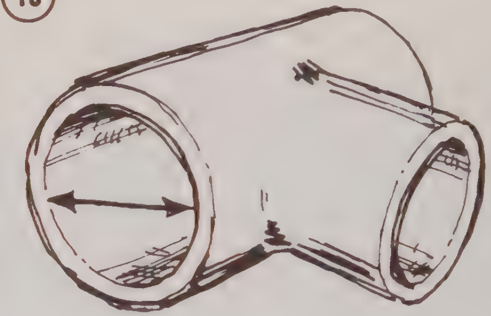

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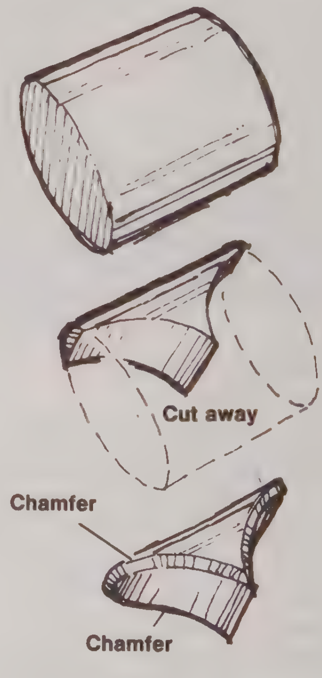

Performance Shops

If you're considering modifications that go beyond basic bolt-on equipment you will require some help from an experienced builder; the benefits derived from having major work done by a first-rate Harley specialist are immeasurable. While your Harley may not be exotic, it does have some peculiarities that have to be dealt with when it is extensively modified.

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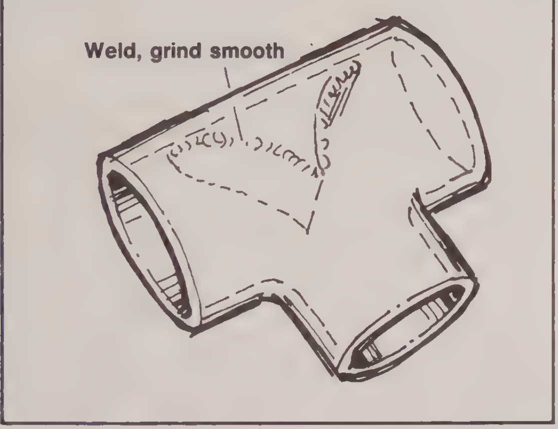

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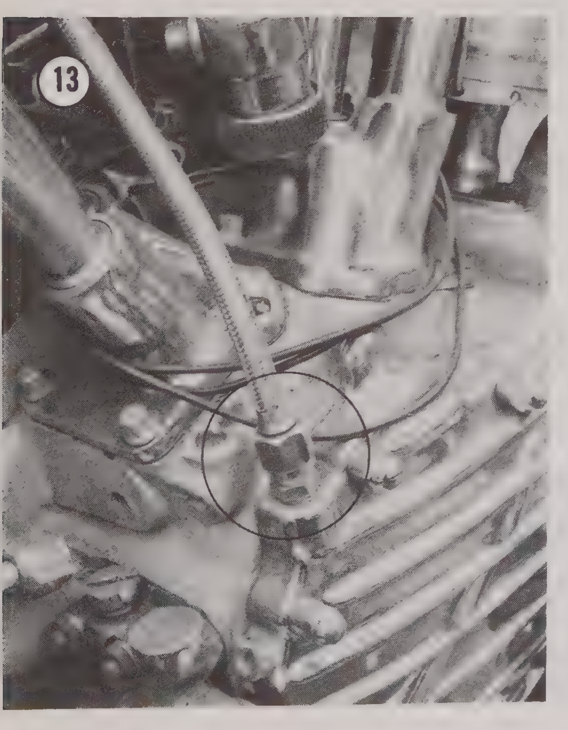

Your dealer may provide good work for basic tuning, service, and rebuild, but he may not have the ability or the inclination to undertake high-performance work.

Unless your dealer has a good reputation as a performance builder you will probably be better off entrusting major work to a proven specialist such as Carl's Speed Shop, Branch Flowmetrics, or Micah McCloskey's Custom Cycles. These builder/suppliers have excellent credentials, they guarantee their work, and they handle mail orders, from individual parts to complete motors.

Panhead Update

Pre-1966 panhead motors can easily be updated to the later shovelhead configuration with little more than a parts exchange. There are several advantages to be gained by making the update.

First, the intake valves in the shovelhead are 1/16 in. larger and thus increase intake flow.

Second, the intake manifold on the shovelhead has better flow characteristics than the Tee manifold used on the panhead.

Third, because of the age of the panhead motor, major parts such as cylinders and heads are becoming increasingly difficult to find. When they can be found they are usually as expensive as later parts. Once the update has been made there is good assurance that parts will be readily available for many years.

The update requires replacement of the entire panhead upper end with shovelhead parts. For 1963-1965 models, the existing mount for the upper end oil line may be used. On earlier models, the oil feed system must be modified to accommodate the upper end oil feed line. The feed can be taken from the tapped hole in the oil pump body that is normally used for the oil pressure sender. It can also be taken from the camshaft cover. To do this, remove the camshaft cover. Drill and tap a hole to accept a 1/8-in. pipe section through the rear protrusion on the cover, into the oil passage (**Figure 13**). Install either a rigid or braided oil line to connect the camshaft cover to the upper end line.

EXHAUST SYSTEM

Horsepower can be gained easily by replacing the stock exhaust system with one that is less restrictive. When buying an aftermarket system make sure the manufacturer can back up any claims made for increased performance; some systems available, particularly two-into-one units, look great but may be as restrictive as the stock system. Gary Bang carries an excellent selection of systems that perform well, are well made, and are pleasantly styled (**Figure 14**).

Harley No. 62A staggered dual pipes, available from most dealers, are efficient and quiet. Another very efficient dual pipe system is sold by Drag Specialties.

If you are running your bike on the street with short drag-type pipes, they should be muffled with slash-tip or tapered-cone mufflers (available through many dealers and suppliers such as Gary Bang). Shorty glasspacks can also be used. While they are a little less noisy than the two types just mentioned, they are more restrictive, although not as much as a stock system.

NOTE

Under no circumstances should open exhaust pipes be run on the street. Not only are open pipes illegal, but their noise reflects adversely on all motorcyclists and provides ammunition for increasingly severe anti-motorcycle legislation.

After installing a less-restrictive exhaust system, you must alter the main jet size and may have to adjust the idle and intermediate circuits in the carburetor. Idle and intermediate adjustments are described in Chapter Two for stock carburetors. Main jet changes should be carried out as described under *Jetting* in this chapter. For non-stock carburetors, the carburetor manufacturer's tuning instructions should be followed and main jet correctness verified as described under *Jetting.*

CYLINDER HEADS/ VALVE TRAIN

The next step in performance work, cylinder head and valve train improvement, is a large one because so much is involved all

at once. When the cylinder heads are reworked, both valve size and quality should be increased. High-performance spring sets and pushrods should be used and the correct camshafts should be selected.

Done separately, these points will yield some increase in performance but not nearly so much as they will if they are done together.

As with other modifications, first determine what you want as a end product. The best starting point is selection of the correct camshafts. Their characteristics will dictate what work must be done to the rest of the system.

Camshafts

Choosing the correct camshafts need not produce headaches, although it frequently does for many Harley owners. The problem lies in the wide range of cams available from several manufacturers. Two manufacturers, Andrews Products and Sifton, are outstanding in terms of experience, success, quality, and a wide range of options.

Andrews Products camshafts (**Figure 15**) are detailed in **Table 1**. Camshafts offered by Sifton approximate the performance characteristics of the Andrews cams. For example, the Sifton 412 and 414 grinds perform like the Andrews J and A grinds, the Sifton 468S is equivalent to the Andrews B grind, and the Sifton 468 Plus is much like the Andrews C. Use **Table 1** as a guide and pay particular attention to the "Description" column.

When a high-performance camshaft set is installed, stock pushrods should be replaced with pushrods from Andrews, S&S, or Manley. Also, either Manley valve spring collars and keepers or complete S&S valve spring sets should be installed.

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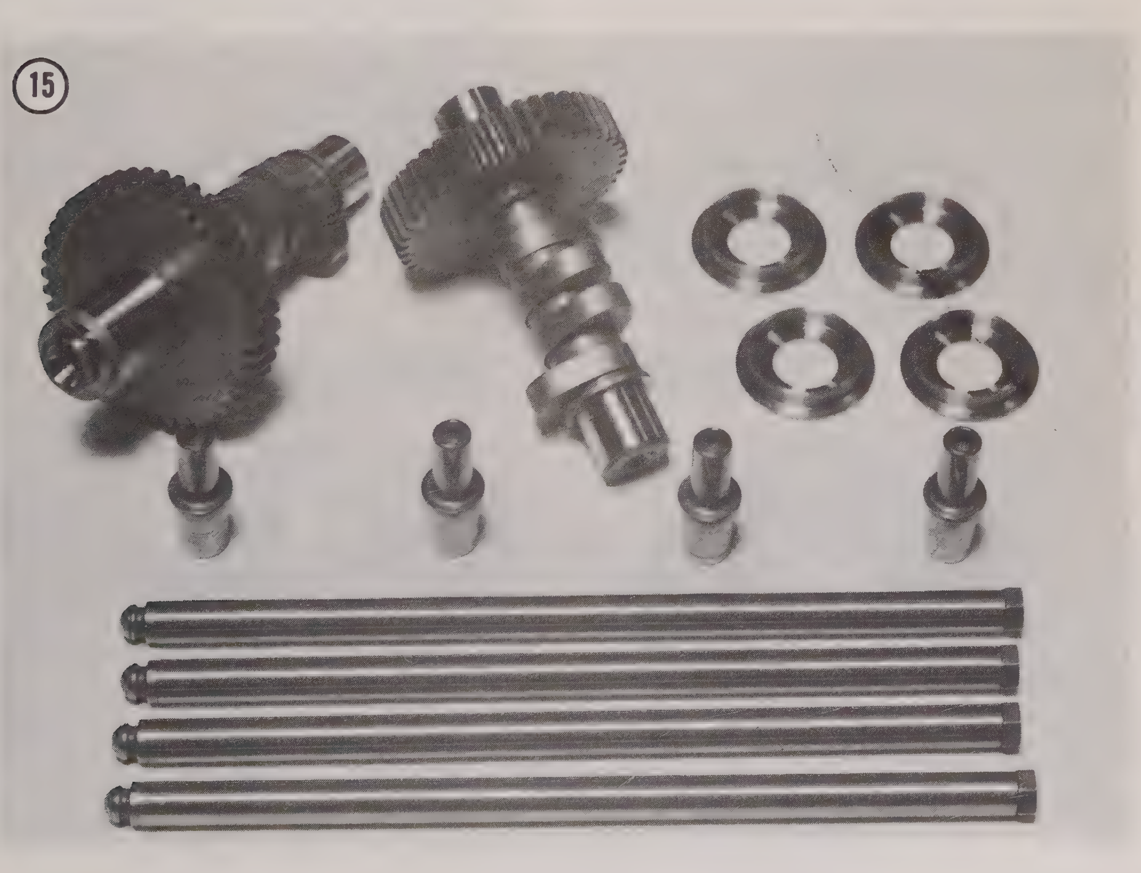


Cylinder Heads

Cylinder head work can range from a simple port cleanup to complete re-engineering of the heads. As mentioned earlier, the camshafts selected will determine the type and extent of head rework required.

Correct porting and polishing is much more difficult than it appears. Along with skilled hands, specific experience is required. Simply increasing the size of the intake and exhaust ports will not guarantee improved flow and, in fact, may degrade it. Unless you have a great deal of experience with Harley headwork, entrust the work to a specialist such as Carl's Speed Shop or Branch Flowmetrics.

When you order headwork, provide the porting service with as much information as possible so they can produce the correct heads for your motor. They will need to know how it will be used, its displacement, carburetor type, exhaust system, and, most important, camshaft grind.

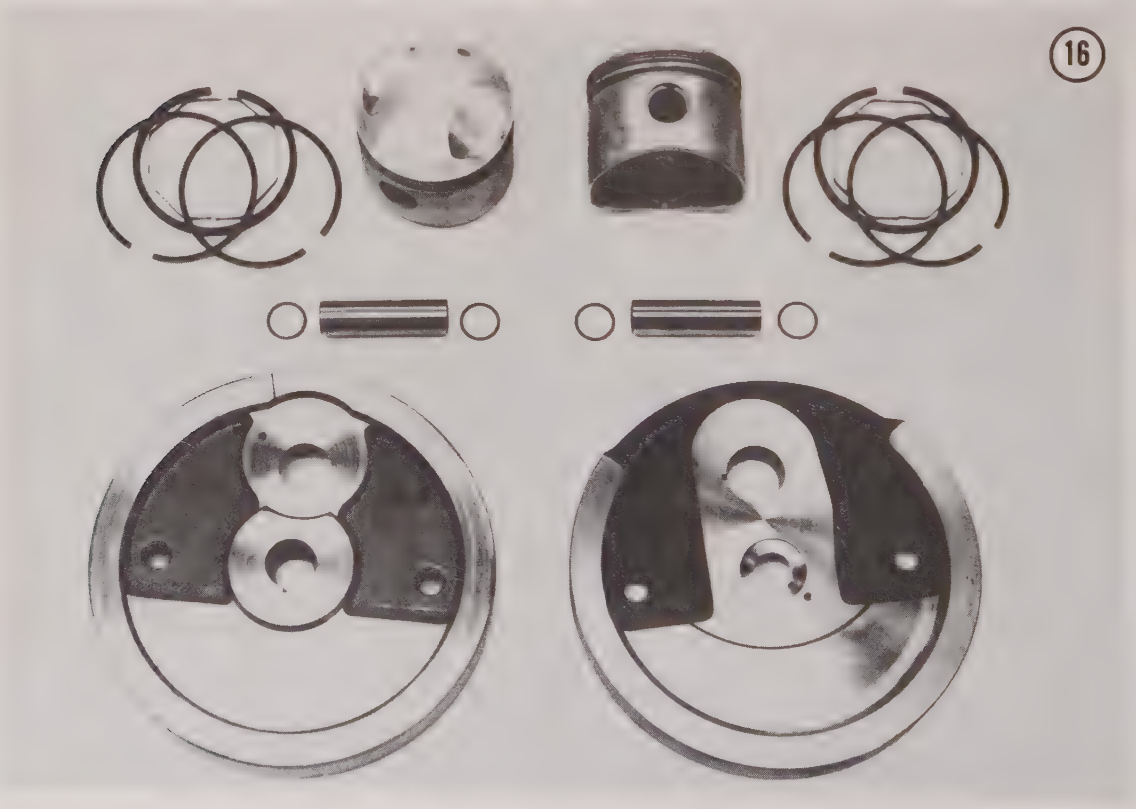
Along with port work, have a precision valve job done. This will ensure that clearances and coil bind are correctly set.

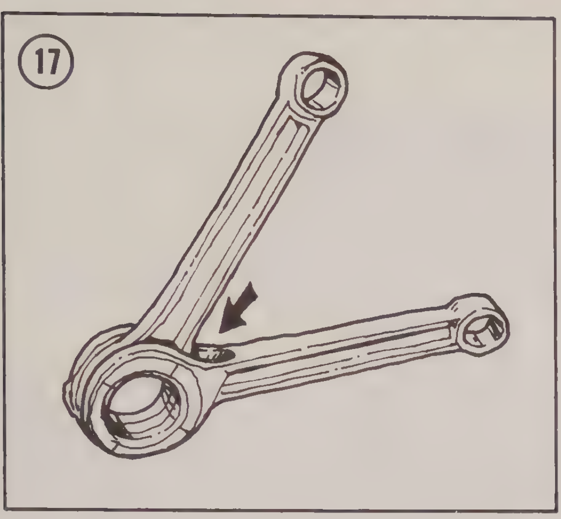
INCREASED DISPLACEMENT

Stroke

The Harley offers a good performance return from increased displacement. Increased bore is usually considered as the first step to gaining inches, but for the Harley increasing the stroke is the preferred way. It's less costly than a bore increase, it has a higher yield, and it doesn't compromise reliability (see *Bore*).

Well-engineered, high-quality stroker kits are available from S&S (**Figure 16**) and other Harley specialists listed at the end of this chapter. The wheels are available in four





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stroke lengths: 4-1/4 in., 4-1/2 in., 4-3/4 in., and 5 in. (stock stroke is 3.96 in.). With standard bore, the resulting displacement for a 74 motor is 80 in., 84 in., 88 in., and 92 in., respectively.

The 4-1/4 and 4-1/2 in. kits require little crankcase modification. Usually, a little bit of material must be removed from the webbing in the timing gear case half to provide clearance for the crankpin nut. For the 4-1/2 in. kit it may also be necessary to remove some metal from the piston skirts to prevent them from hitting each other when the crankshaft is at BDC.

The 4-3/4 and 5 in. kits require a little more work. First, the top of the slot in the female connecting rod must be enlarged (**Figure 17**) to provide clearance for the male rod when the crankshaft is at BDC. This is necessary because as the stroked length is increased, the angle between the rods at BDC is decreased.

The 4-1/4 and 4-1/2 in. kits are well suited to street and touring bikes, while the 4-3/4 and 5 in. kits are strictly for play bikes and racing. Engine life and reliability are reduced for long-stroke motors and they are much harder to start. S&S stroker kits are accompanied by highly detailed, clearly written instructions to the letter. If you are having the work done by anyone other than a recognized Harley specialist, make certain the instructions are followed.

For moderate stroke street and touring motors it's recommended that the stock connecting rods be shot-peened, polished, and Magnafluxed to detect structural flaws. Long-stroke motors should be fitted with either S&S heavy-duty rods or boxed rods manufactured by Joe Smith.

For serious big-inch gas- and fuel-class racing, you may want to consider replacing the stock crankcase with the heavy-duty STD crankcase from Micah McCloskey. The STD crankcase (**Figure 18**) is made of high-strength aluminum alloy, has thicker walls and webbing than the stock crankcase, and the drive-side main bearing race is pinned and welded to prevent it from rotating and destroying the lower end during high-rpm shifts. The STD crankcase has a flywheel oil scraper that improves oil scavenging and permits the wheels to run freer because of decreased oil drag.

Engine mounting bosses are stronger than those on the stock crankcase. The STD case halves are sold as a set (for about $525) and will not mate to stock crankcase halves.

Installation of stroker wheels requires complete disassembly of the motor. The work is described in Chapter Three. Inspect the engine as described and replace any parts that are worn; the increased stroke and displacement will place greater loads on all stressed components, and any that are less than perfect could easily fail and create some very expensive damage.

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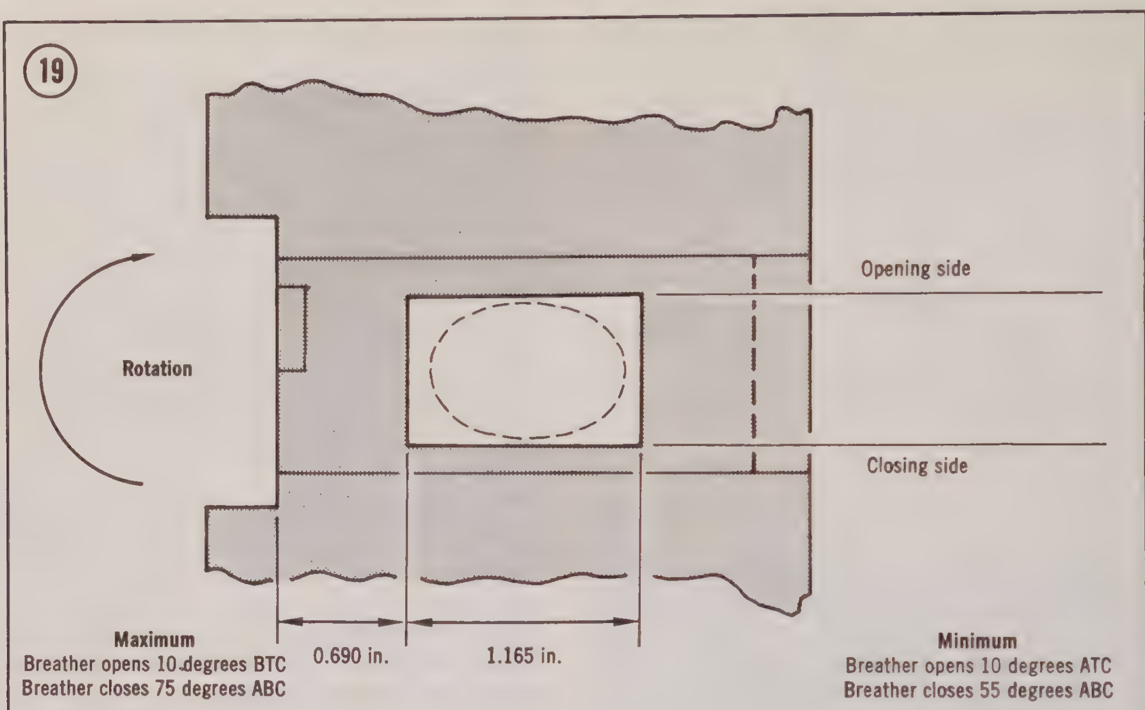
Rotation
Opening side
Closing side
0.690 in.
1.165 in.
Maximum
Breather opens 10 degrees BTC
Breather closes 75 degrees ABC
Minimum
Breather opens 10 degrees ATC
Breather closes 55 degrees ABC

Oil Breather Timing

Correct oil breather timing is essential to all Harley motors. Breather timing that is marginal for a stock motor is usually not critical, although even stock motors have been destroyed by a incorrectly timed and sized breather. For a modified motor, and particularly for one that has been stroked, oil breather timing and size are very important.

In a stock crankcase, the "as-cast" hole is often incorrectly positioned and too small. However, the problem is easy to correct by installing a degree wheel on the crankshaft and checking the timing of the breather with the position of the crankpin for the front cylinder. The opening range of the breather should be from a maximum of 10° BTDC to a minimum of 10° ATDC. The closing range should be from a minimum of 55° ABDC to a maximum of 75° ABDC. The maximum specifications are preferred to the minimum when timing the breather opening.

To modify the breather hole and correct the timing, the engine must be disassembled so the breather hole can be correctly positioned

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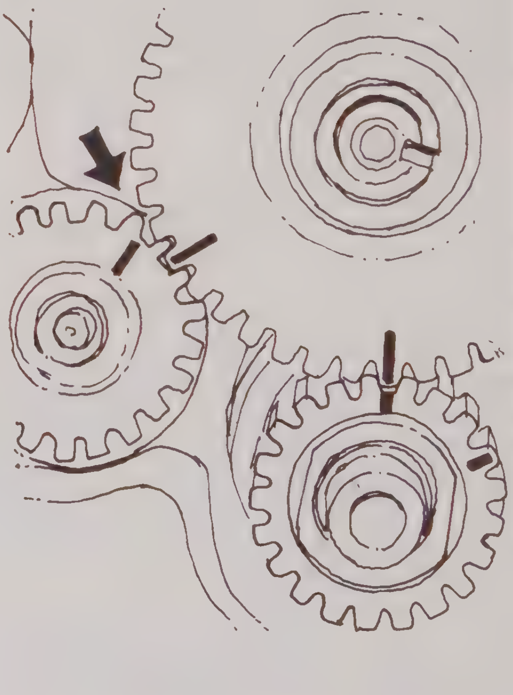

and recontoured from an oval to a rectangle (**Figure 19**).

For very large displacement motors it's recommended that the breather screen be removed and the breather advanced one notch on the camshaft gear (**Figure 20**).

Bore

Increased cylinder bore for the Harley requires crankcase modification and some expensive parts. With the possible exception of the S&S Sidewinder (described later), big-bore motor kits are intended for serious racing.

It's possible to gain a few more inches for a relatively low initial cost by boring the stock cylinders 0.100 in. over and installing new pistons. This will increase the displacement of a stock-stroke 74 to 77.9 in. It's not recommended, however; this method greatly shortens cylinder life and when a rebuild is required the cylinders will have to be replaced.

Trock Cycle Specialties manufacturers a kit (**Figure 21**) that is available with either a 3-3/4 or 3-13/16 in. bore. When used with stock flywheels, the smaller kit will yield displacement of 87.6 in.

S&S manufactures big-bore kits in several sizes as well as an inexpensive big-bore/stroker kit (**Figure 22**) that is intended for street use. Called the Sidewinder, the kit includes all the parts that are required for the modification. The bore is 3-5/8 in. and the stroke is 4-1/4 in. Displacement with the Sidewinder kit is 93 in. The kit sells for around $500. Other combinations for racing applications are also available from S&S.

Both Trock and S&S kits require cylinder head and crankcase modifications prior to installation. The S&S kits are for shovelhead motors only. Trock kits are available for all three motor configurations.

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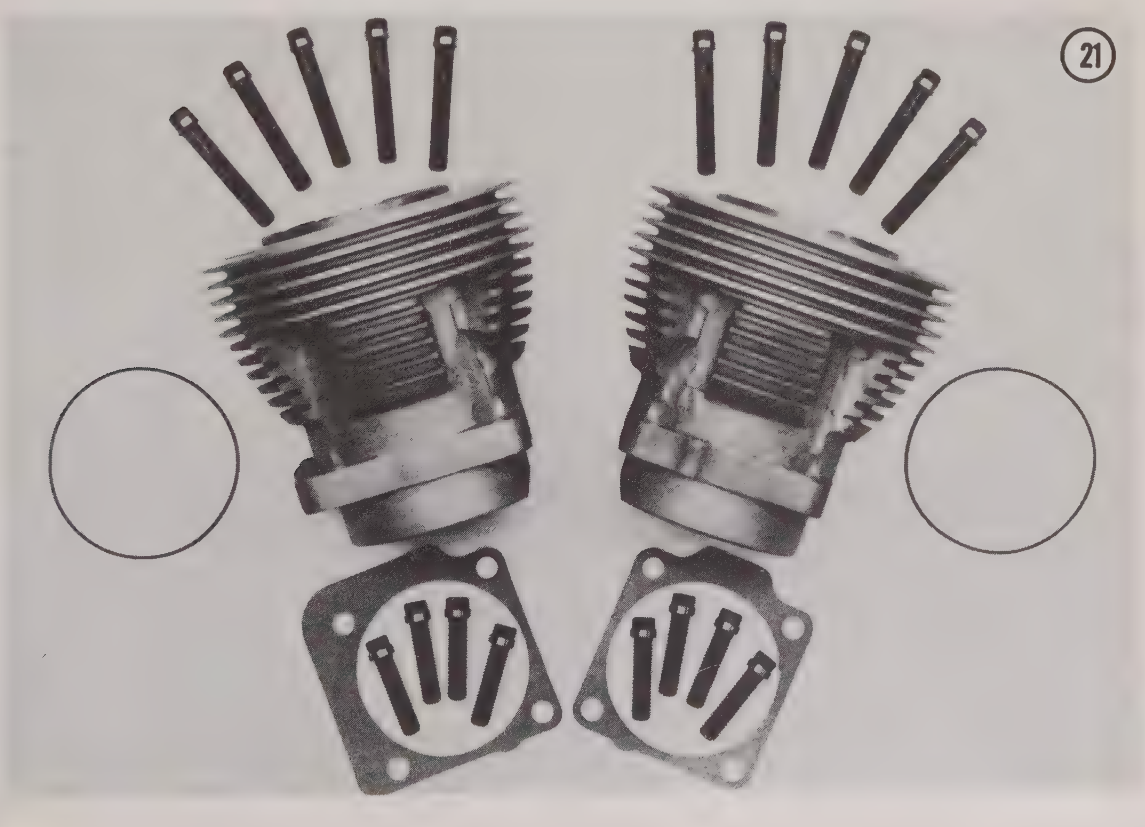

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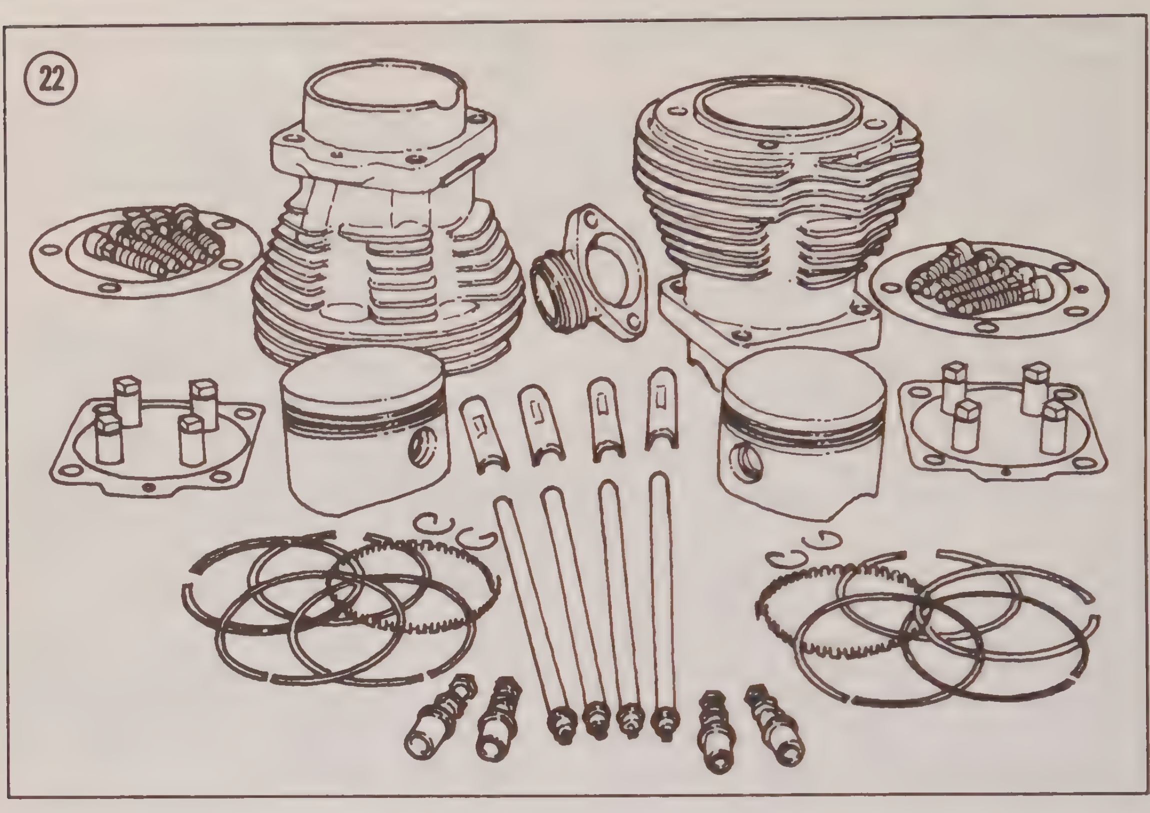

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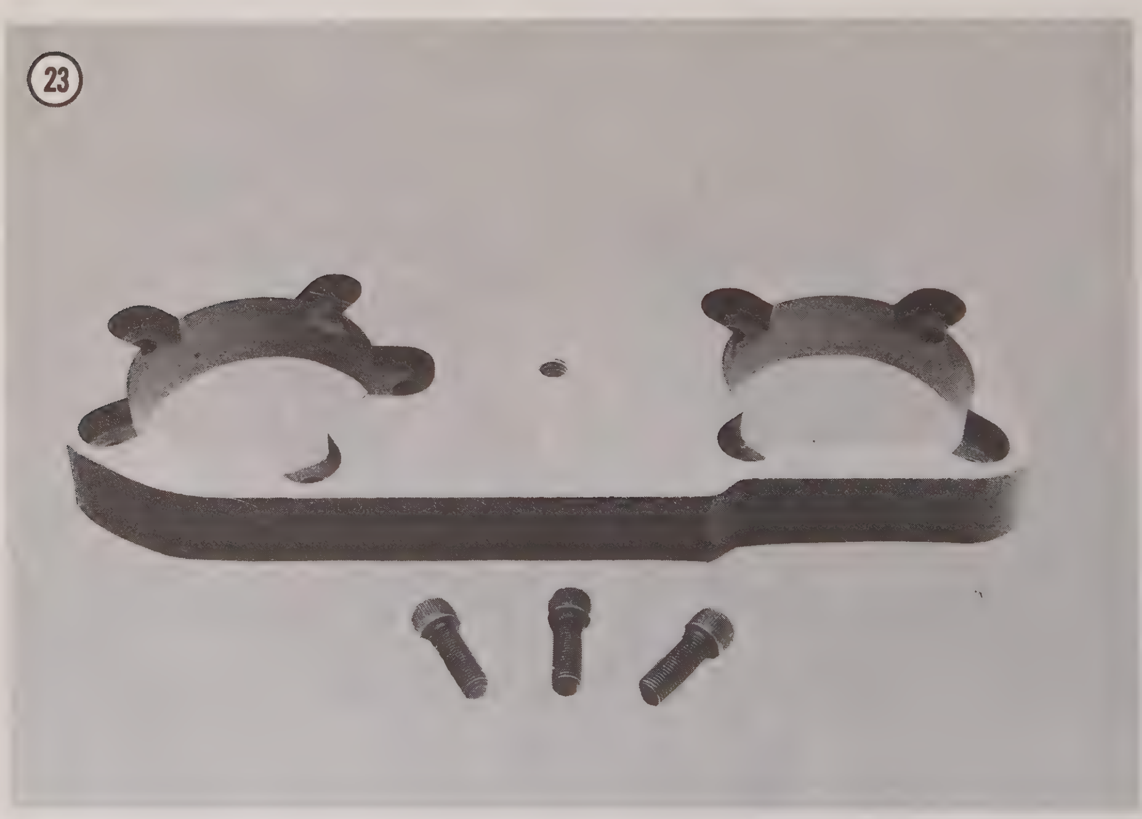

The S&S kits include a boring plate (**Figure 23**) that can be attached to a standard automotive boring bar. Prior to installation of the kit, the cylinder heads and crankcase must be bored to accept the larger cylinders. Additional crankcase modifications are also required because of the increased stroke (see *Stroke*). The modification and assembly of the motor is straightforward as long as the detailed instructions that come with the kits are followed.

Pistons

High-compression pistons provide a significant performance increase, but it's accompanied by higher operating temperatures and shorter engine life. Also, the low quality of most gasoline available today makes it unsuitable for high-compression motors, although octane boosters help.

For street motors, compression should be limited to 9-10:1. Cast pistons should be used rather than forged pistons (**Figure 24**). The expansion rate of cast pistons is closer to the expansion rate for the cylinders. This permits closer assembly tolerances to improve sealing and reduce noise. Cast pistons are also more porous than forged pistons and have better cylinder lubrication characteristics.

HIGH-PERFORMANCE CARBURETION

After displacement has been increased and the heads and exhaust system made to flow more efficiently, major improvement in carburetion is logically the next area to be given some attention.

In addition to the modified Tillotson and Bendix carburetors described earlier (best suited to mild, moderate-size motors), several proven carburetors exist as options.

38-44mm Mikuni

The basic Mikuni slide carburetor has been adapted to a wide range of engines, including Harley. There are several kits available; the best seems to be the one offered by Branch

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Flowmetrics, available either direct or through most dealers and specialty shops.

The kit includes everything that is required for installation–carburetor, filter, mounting brackets, and spring-return throttle. The kit includes baseline jetting that corresponds to the displacement of the motor it will be used on. Because the Mikuni has such a broad range of jetting available, it's wise to begin with a kit that comes close to providing the correct fuel/air mixture ratios at the beginning.

The Mikuni's strong points are easy starting, excellent low- and mid-range response, and super fuel economy–as much as 60 mpg. Its shortcoming is that it won't contribute much to horsepower. It is best suited to touring motors.

Mikuni/Weber

The Mikuni/Weber is a super efficient dual throat carburetor with excellent flow characteristics and predictability. It is best suited to large displacement motors. It is much smaller than the automotive Weber so it doesn't interfere with the rider's right leg and is thus suitable for street motors.

The carburetor and all of the parts required to install it are available from Branch Flowmetrics as a kit. It comes with baseline jetting tailored to displacement and use.

Weber

The dual-throat side-draft Weber automobile carburetor has outstanding flow characteristics. It's very complex and, if chosen, it should be purchased from a specialist who is capable of setting correct baseline jetting and adjustments for Harley

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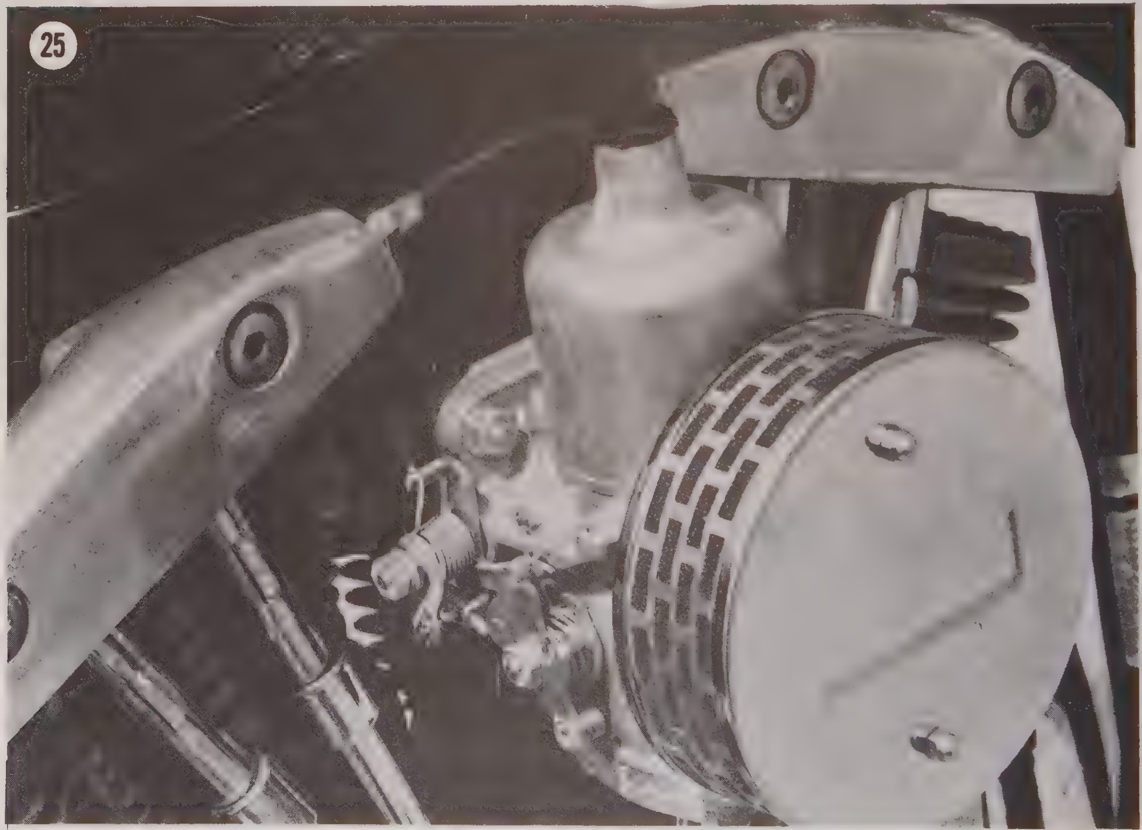

application. Its considerable size makes it impractical for street use.

SU

Not long ago the English SU automobile carburetor was in vogue with many Harley builders. The SU (**Figure 25**) is a demand type diaphragm carburetor that can be made to work well on the Harley. It has good starting and low- and mid-range characteristics but is not as good for high performance as some of the other carburetors described.

The SU can be a difficult carburetor to tune from scratch because of the near-endless combinations of jets and needles that are available. If chosen, the SU should be purchased from Carl's Speed Shop. The model offered is a new, 1-7/8 in. SU that is carefully set up for your motor's displacement and use.

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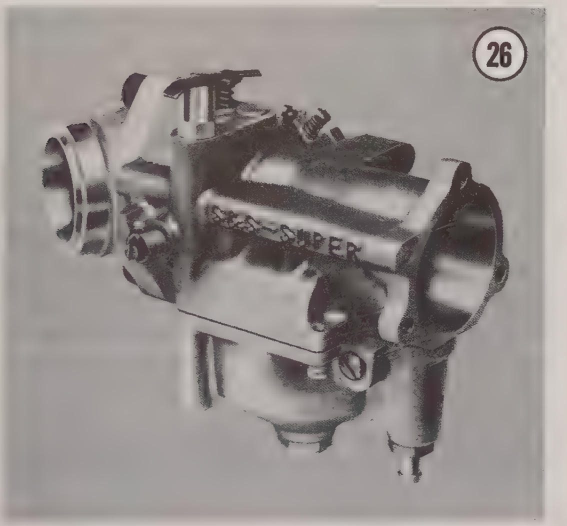

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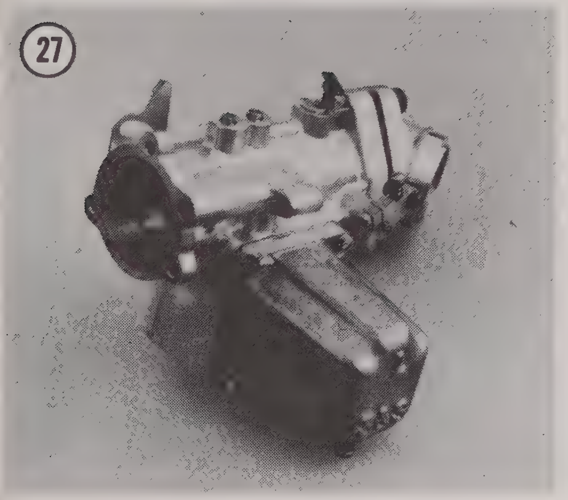

S&S Super

The S&S Super was originally designed for drag racing by the late George Smith. Based on the old Sportster Linkert, the Super is a more precise and sosphisticated version of the easily modified stock favorite.

In Smith's capable hands the Super evolved from its no-compromise beginning to where today it is not only an excellent drag-racing carburetor but is also a well-behaved unit for large-displacement street motors.

The Super (**Figure 26**) is a simple carburetor. Low end is regulated by an idle tube, top end by the main jet, and idle by a setscrew. It's available through S&S as well as many dealers and specialists. It comes with all the hardware required to install and tune it, along with complete and clearly written instructions.

S&S MGL

The MGL (**Figure 27**) was developed and sold by S&S some years ago as a high-performance carburetor for very large street motors. It was discontinued for a time but has been recently reintroduced because of increased demand.

Available with complete bracketry, good baseline jetting, and detailed instructions for installation and tuning, the MGL is strictly for big-inch motors; S&S discourages its use on anything other than a big, highly modified powerplant.

Installation of a high-performance carburetor alone won't provide a significant gain in horsepower. With the exception of the 38-44mm Mikuni, the carburetors just described are meant to be used on motors that are more than just a little modified. Small to moderate non-radical motors will experience a small gain in overall power with most improvement experienced in mid-range performance.

The super mixers can't be fully appreciated until they are used on a large highly modified motor. It's important that you consider what you have just learned about the characteristics of the high-performance carburetors and then match those characteristics to your planned-for modifications.

JETTING

What you are about to read could be the most important piece of information in this chapter. It should be part of your basic knowledge no matter how much or how little you modify your motor. It applies to all motors and all uses. The subject is correct jetting and how to obtain it. Thoroughly understood and correctly applied, it will make precise tuning much easier.

Before you do anything to determine and obtain correct jetting, first make sure that all the other factors that control a motor's state of tune–ignition timing and condition, spark plug heat range, gap, and condition, and valve clearance–are correct. For this information refer to Chapter Two, *Engine Tune-up*.

Next, thoroughly warm up the motor and run the bike at full throttle (about 5,000 rpm) in top gear for about 1/8 mile on a safe and deserted stretch of road. If possible, do this on a slight up-grade. Then, quickly close the throttle, pull in the clutch, shut off the ignition, and stop the bike with the brakes–not under compression.

Remove the spark plugs and "read" them, comparing their condition to the illustration in Chapter Two. The condition you want to achieve is a light to medium tan color on the insulation around the center electrode.

If the insulation is white, the jetting is too lean and the size of the main jet must be increased. In a fixed-jet carburetor this is done by replacing the main jet with a larger one. In a carburetor with an adjustable main jet, increase the jet size by screwing the adjuster screw out.

If the insulation is dark brown or wet, the main jet is too rich. In a fixed-jet carburetor, replace the main jet with a smaller one, and in a carburetor with an adjustable main jet, screw the adjuster screw in.

While this method is easy to understand and apply, it is not a quick shortcut; obtaining precise jetting requires time and patience, and several runs up the road. Don't try to anticipate the plug reading on the next run. Make changes one jet size at a time (for fixed-jet carburetors) or 1/8 screw turn at a time (for adjustable main jet carburetors).

After all of your careful work it would be nice if jetting never again had to be checked and changed. But, two variables–altitude and humidity–will occasionally change the mixture ratio and make the jetting wrong. This is a situation that must occasionally be lived with. It's important the carburetor be jetted for the conditions of altitude and humidity that you are most likely to encounter.

IGNITION

The stock ignition is adequate for all applications short of top fuel and gas class drag racing. A magneto, such as the Joe Hunt (**Figure 28**), is a must for a competition-only bike where towed starts are employed and a

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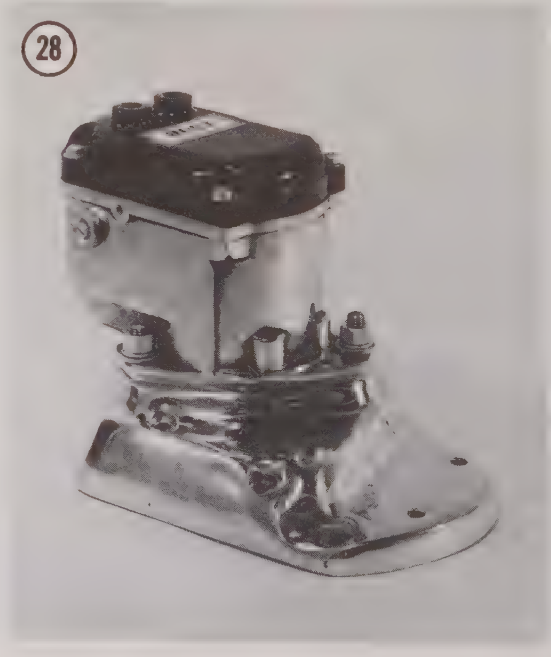


strong, consistent spark is required at high rpm, under high compression load.

The magneto's characteristically low output at low rpm such as during starting, makes it a poor choice for a street motor. It will very likely make the motor impossible to kickstart most of the time.

POWER TRAIN

The stock power train (transmission, clutch, and primary drive) works well with stock displacement motors and those that are not extensively modified. For large-displacement radical motors some changes are required.

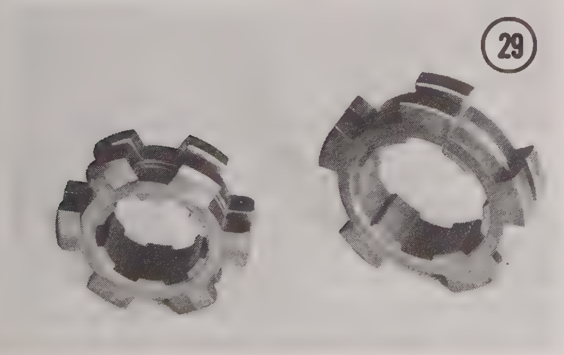
Gearing

There is a wide range of gearing available for the Harley that enables you to tailor it to all use conditions. Because of the variable involved–bike weight, rider weight, engine output, use–some experimentation is required to arrive at the right combination.

However, as a starting point for a modified, larger than stock street motor, it's recommended that you begin with a 24-tooth engine sprocket, 37-tooth clutch hub (stock), 22-tooth countershaft sprocket, and 51-tooth (stock) rear wheel sprocket. High-quality sprockets are available from Circle Industries.

Transmission

The Harley transmission can be greatly improved by replacing the stock gears with gears from Andrews Products. They are stronger than stock gears and are designed to shift easier.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Andrews gears include:

a. 2.44:1 first gear for light bikes with lower-than-stock engine and transmission sprockets.
b. 2.60:1 first gear for Electraglides and bikes with higher-than-stock engine and transmission sprockets.
c. Stock ratio second gear with face-milled shifting dogs that provide smoother 1-2 shifts.
d. Close-ratio third gear.
e. Stock third gear (required for 1964 and earlier when close-ratio first gear is used).
f. Stock fourth gear with wider engagement slots and larger lead-in angles for quicker 3-4 shifts.

Andrews gearbox clutches (**Figure 29**) should also be used in place of the stock parts. The Andrews clutches are shot-peened and heat-treated and are much stronger than the originals.

Clutch

Stock clutch plates should be replaced with a set of Barnett plates (available through some dealers and from Gary Bang and Micah McCloskey). New Barnett clutch springs and a lined clutch cable should also be used.

For 1968 and later models, the stock eliminator should be replaced with a mousetrap throwout to accomodate the increased throwout travel.

Belt Drives

Significant reductions in noise, vibration, weight, and power loss can be realized by replacing the stock primary chain drive with a belt drive.

One of the best belt drive systems is offered by Phase 3. It consists of a toothed engine sprocket hub, toothed clutch hub, and drive belt. Unlike most belt drives which are run exposed, the Phase 3 may be run with stock primary drive covers which protect it from road grit and oxidation.

Because belt drives are run dry, the oil supply to the primary drive can be blocked off, thus eliminating oil leaks from the primary case.

CHASSIS

As we said at the beginning of this chapter, suspension improvement for the Harley is limited. The bike's considerable weight, low ground clearance, and short suspension travel make it unresponsive to major changes for handling improvement. The changes described here will marginally improve handling and rider comfort.

Front Suspension

One-inch-long pipe sections can be installed in the fork tubes, above the springs, to provide pre-load and slightly increase useable fork travel. Measure the ID of the fork tubes and select pipe stock with an OD slightly smaller. When installing the tube caps, it will be necessary to support the front of the motorcycle so its weight doesn't bear on the springs.

Damping can be slightly improved by replacing the recommended Harley "B" oil in the forks with Torco 20-weight fork oil. Drain and refill the forks as described in Chapter Seven, *Fork Oil*, using the amount recommended.

Rear Suspension

Rear suspension travel is extremely limited and resulting ride and handling problems are compounded by the poor performance of the rear shocks.

For drag racing, the substitution of rigid rear struts for the shocks will aid weight transfer and help keep the rear tire in contact with the pavement. For street riding and touring, rigid struts produce an uncomfortable ride.

A good compromise, for improved ride comfort and handling on the street and highway and good weight transfer characteristics for drag racing, are S&W air shocks (**Figure 30**). They use variable air pressure rather than springs to support the wight of the bike and are damped conventionally (although more precisely than stock shocks) with oil.

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The S&W shocks mount in place of the stock shocks, but care must be taken to make sure that the bulging air reservoirs don't come into contact with the fender, chain, or chainguard when the shocks are under full compression. Otherwise, the air reservoirs will wear through and render the shocks useless.

When installed, the air line from each shock connects to a simple manifold that is fitted with a Schraeder valve through which air can be added or removed equally from both shocks to alter their "spring" rates.

The adjustment range of the S&W air shocks is virtually infinite. For solo street riding they can be run with low air pressure to provide a soft, comfortable ride. For two-up touring the air pressure can be increased to accommodate passenger and luggage load. And for drag racing, the shocks can be

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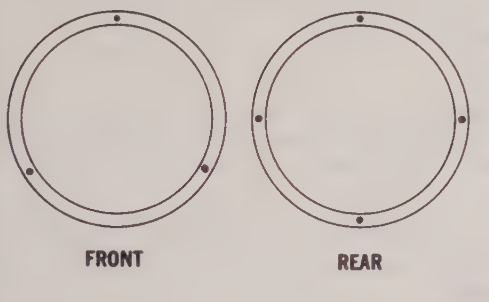

pumped up until they are almost as stiff as rigid struts.

Wheels

The heavy stock spoked wheels can be replaced with lighter Lester, Morris, or Performance Machine cast alloy wheels. These wheel offer increased blowout and flat safety because their deeply dished centers make them less prone to de-mounting the failed tire. They also improve tire life because of their increased rigidity over spoked wheels. Harley-Davidson also offers an accessory cast wheel that is available only in the traditional 16-in. diameter.

Brakes

Accessory disc brake systems are available for all the cast wheels except the Harley-Davidson type (**Figure 31**). Performance Machine offers a good selection but their Hurst/Airheart package is not recommended for heavy dressers.

Stock Harley disc brakes can be improved by using the Performance Machine cast and drilled meehanite discs which stop better in both wet and dry weather.

Tires

Recommended tires for a high-performance Harley are rounded-section Pirelli, Arco or Continental.

Popular 15-in. radial automobile tires should be avoided. The flexible sidewalls of a radial tire distort under heavy cornering loads to permit the tread to remain flat on the road. This works very well when there is a high vertical load on the tread, such as occurs with an automobile. For a motorcycle, however, the vertical load decreases during hard cornering and as a result, a radial tire will go from near-maximum traction to no traction suddenly and with no warning.

For conventional wheels, with either steel or aluminum rims, sheet metal screws should be used to prevent the tires from "creeping" on the wheel during hard acceleration and braking. Before mounting the tires, drill 1/8-in. holes through the rim flanges: 4 on each side, 90° apart for the rear; and 3 on each side, 120° apart for the front (**Figure 32**). Depending on the thickness of the rim flange, select No. 10 sheet metal screws that will protrude 3/16-1/4 in. from the inside face of the rim flange when the screws are seated. Then, mount the tires, inflate them to the recommended pressure, and screw in the sheet metal screws to lock the tire bead to the rim flange.

SUMMARY

The Harley may be a bit dated, but with careful planning, skilled work, and generous doses of money it can be turned into a strong straight-line performer that will pull the paint off most superbikes without sacrificing its inherently good reliability.

Table 1 ANDREWS CAMSHAFTS

Grind	Timing	Duration (degrees)	Valve lift (in.) Shovel	Pan	Description
J	I 21/41 E 41/21	242 242	0.405 0.405	0.425 0.425	Mild street; smooth idle; power increase throughout range; no headwork required.*
H	I 36/44 E 44/36	268 268	0.426 0.426	0.450 0.450	Touring grind; for use with hydraulic lifters; improved mid-range; smooth idle and low-speed performance.
A	I 21/43 E 43/21	244 244	0.450 0.450	0.470 0.470	Street/drags; improved midrange and top-end; smooth idle; no headwork required on Shovels.*
B	I 26/50 E 50/26	256 256	0.485 0.485	0.507 0.507	Hot street/drags; strong mid-range and top-end; smooth idle; modified motors and small strokers; headwork required.*
6	I 32/56 E 56/32	268 268	0.510 0.510	0.535 0.535	Hotter version of B grind; big street strokers (84-88 in.); maximum torque from 2,500-6,500 rpm; headwork required.*
C	I 37/61 E 61/37	278 278	0.525 0.525	0.550 0.550	Hottest production cam; for modified big strokers; broad torque range (2,000-7,000 rpm); headwork required.*
D	I 34/66 E 66/34	280 280	0.550 0.550	- -	Street/drags; for modified big strokers (92 in. up); best with 9.5:1 and higher compression; headwork required.*
M	I 28/56 E 56/28	264 264	0.590 0.590	- -	Street/drags; for modified 88 in. motors; maximum midrange torque (3,000-6,500 rpm); headwork required.*
Z	I 40/66 E 66/40	284 284	0.590 0.590	- -	Drags; for 88-in. motors with high compression (10.5:1 and up); light chassis; maximum top-end power (4,000-7,500 rpm); headwork required.*
S	I 27/55 E 55/27	262 262	0.370 0.370	- -	Knuckle equivalent of B grind; replacement for stock motors; smooth idle; good mid-range power (to 6,000 rpm); no headwork required.*
K	I 35/63 E 63/35	278 278	0.367 0.367	- -	High-performance for Knuckle; for high-compression strokers; 3,000-7,000 rpm power range; headwork required.*

*Required headwork involves checking and correcting for coil binding, valve guide length, and valve-to-piston clearance. In addition, porting and polishing are recommended.

Table 2 PARTS SUPPLIERS/SERVICES

Supplier	Service
Andrews Products, Inc. 5212 N. Shapeland Ave. Rosemont, Ill. 60018	Camshafts, lifters, pushrods, gears
Gary Bang Motorcycle Products P.O. Box 472 Canoga Park, CA 91305 or 1076 King Industrial Dr. Marietta, GA 30062	Performance equipment
Barnett Tool and Engineering 9920 Freeman Ave. Santa Fe Springs, Calif. 90670	Heavy-duty clutch parts and kits
Branch Flowmetrics 7051 Village Dr. Buena Park, Calif. 90621	Headwork, carburetors
Carl's Speed Shop 9411 Santa Fe Springs Rd. Santa Fe Springs, Calif. 90670	Carburetors, headwork, engine building
Circle Industries 17901 Arenth Ave. City of Industry, Calif. 91748	Sprockets
Drag Specialties 5401 Smetana Drive Minnetonka, Minn. 55343	Exhaust pipes
Joe Hunt Magnetos 1724 Crenshaw Blvd. Torrance, CA 90501	Magnetos
Lester Tire and Wheel Co. 26881 Cannon Rd. Bedford Heights, OH 44146	Alloy wheels
Micah McCloskey's Custom Cycles 21426 Sherman Way Canoga Park, CA 91303	Performance equipment, engine building, heavy duty engine crankcases
Morris Industries 2901 West Garry Ave. Santa Ana, Calif. 92704	Alloy wheels
Performance Machine 15520 Illinois Ave. Paramount, Calif. 90723	Alloy wheels, brake kits
Phase 3 of America, Inc. 15528 Illinois Ave. Paramount, Calif. 90723	Belt drives
S & S Products, Inc. P.O. Box 215 Viola, Wisc. 54664	Stroker wheels, carburetors, pushrods, lifters, camshafts
Sifton Motorcycle Products 943 Bransten Rd. San Carlos, Calif. 94070	Camshafts, lifters, pushrods
Joe Smith Engineering 1530A Industrial Park Covina, CA 91722	Camshafts, engine building
Trock Cycle Specialties R.R. 2, Box 415G, French Rd. Hampshire, Ill. 60410	Big bore kits

SUPPLEMENT

1976 AND LATER SERVICE INFORMATION

This supplement provides service procedures unique to the 1976 and later Harley-Davidson motorcycles listed below. Other service procedures remain the same as described in the basic book, Chapters One through Eight:

a. FL, FLH, FLHS: Electra-Glide, Classic.
b. FX, FXE: Super-Glide.
c. FXEF: Fat Bob.
d. FXWG: Wide-Glide.
e. FXS, FXSB: Low Rider.
f. FXB: Sturgis.

The chapter headings One through Eight in this supplement correspond to Chapters One through Eight in the main portion of this book. If a chapter is not referenced in this supplement, there are no changes affecting that chapter; follow the procedures described for the latest comparable model in the basic book.

CHAPTER TWO

PERIODIC MAINTENANCE

Emission Controlled Motorcycles

This supplement covers both emission controlled motorcycles manufactured after January 1, 1978 and non-controlled motorcycles built before that date. If you have a late 1978 or later bike, we urge you to follow all procedures specifically designated for your machine. If you don't follow the maintenance schedule (**Table 1**) in this manual, or if you alter engine parts or change their settings from the standard factory specifications (ignition timing, carburetor idle mixture, exhaust system, etc.), your bike may not comply with government emissions standards.

In addition, since most emission controlled bikes are carburetted on the lean side, any changes to emission-related parts (such as exhaust system modifications) could cause the engine to run so lean that piston seizure would result.

NOTE

If you have a brand new motorcycle, we recommend you take the bike to your dealer for the initial break-in maintenance at 500 miles and at 1,250 miles.

Table 1 is a recommended minimum maintenance schedule for late 1978 and later machines. However, you will have to determine your own maintenance requirements based on the type of riding you do and the place you ride. If you ride in dusty areas or at high speeds or if you make a lot of short 5 or 10 minute rides, service the items more often. Perform the maintenance at each TIME or MILEAGE interval, whichever comes first.

ENGINE TUNE-UP

The following list summarizes tune-up procedures for emission controlled motorcycles. Specific instructions are included in this supplement, if there are any changes from the procedures described in the basic book. Check the engine carefully and proceed systematically. This list is arranged so that you start with the jobs that require a "cold" engine and finish with the jobs that call for a fully warmed-up engine. If you follow the sequence here you won't waste time waiting for your bike to cool down when required. See **Table 2** for tune-up specifications.

See Chapter Eight in the basic book for troubleshooting procedures when you suspect other problems.

1. Inspect the air cleaner filter and clean it or install a new one.
2. Remove and clean the fuel tank strainer. Inspect the fuel lines for cracks or leakage.
3. Inspect the spark plugs and clean them and adjust the gap. Replace them at the scheduled intervals. Leave the plugs out until after you check cylinder compression.
4. Check and record cylinder compression.
5. On late 1978-1979 motorcycles, inspect the mechanical ignition advance operation.
6. Inspect the ignition timing and adjust if necessary.
7. Adjust the carburetor if required.

IGNITION TIMING

A breakerless electronic ignition system with centrifugal advance was introduced in late 1978, with the addition of a full electronic ignition advance in 1980. See the Chapter Six section in this supplement for inspection and adjustment.

CARBURETOR ADJUSTMENTS

The Keihin carburetor was introduced in 1976. In late 1978 an idle mixture limiting cap was added and in 1980 the idle mixture screw was permanently sealed inside the carburetor body. Only idle speed and fast idle are adjustable on 1980 and later models, but an optional high-altitude jet kit is available from your dealer if you have driveability problems when riding above 4,000 feet. See the Chapter Five section in this supplement for carburetor adjustment.

OIL AND OIL FILTER

The oil filter on all 1983 and later models is mounted under the motorcycle, behind the transmission and in front of the rear tire. See **Figure 1**. When installing the oil filter on these models, apply engine oil to the rubber seal on the oil filter. Tighten the filter an additional 1/4-1/2 turn after the seal contacts the filter mounting surface.

BRAKES

The late 1979 and later FL models and FXWG models have a different rear brake adjustment procedure. See the Chapter Seven section in this supplement for adjustment.

WHEELS AND TIRES

Table 3 lists proper tire pressures. Always measure tire pressure when the tires are cold.

PRIMARY CHAIN DRAIN PLUG

On late 1978 and later chain-drive models the primary drive drain plug is magnetic. It should be cleaned thoroughly according to the maintenance schedule (**Table 1**).

DRIVE BELTS

Some models have rubber toothed final and/or primary drive belts, with rubber compensating sprocket dampers and different clutch hub bearings for the primary drive belt. See the Chapter Nine section in this supplement for inspection, adjustment and replacement.

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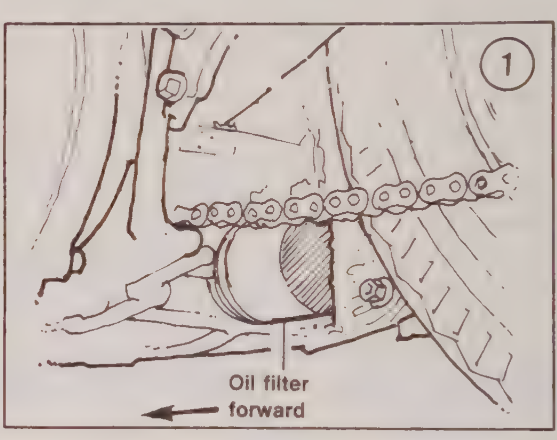

Table 1 MAINTENANCE SCHEDULE (LATE 1978 AND LATER)

EVERY 500 MILES or WEEKLY	
Engine oil	Check level
Drive chain	Lubricate, if required
Tires	Check pressure, wear
Battery	Check electrolyte level
EVERY 1,250 MILES or MONTHLY	
Transmission oil	Check level
Air filter	Inspect/clean
Primary chain	Inspect/adjust free play
Drive chain	Inspect/adjust free play
Drive chain oiler	Check adjustment, if so equipped
Brakes	Inspect/adjust rear pedal play; check pad and disc wear
Leakage	Inspect engine oil lines, brake fluid lines, and fuel system for leaks
Wire wheels	Inspect/adjust spoke tightness
Nuts, bolts, fasteners	Check all, especially steering, suspension, axles, and controls
Lights and switches	Check operation of all

(continued)

Table 1 MAINTENANCE SCHEDULE
(LATE 1978 AND LATER) (continued)

EVERY 2,500 MILES or 6 MONTHS	
Engine oil	Change
Oil filter	Change
Brakes	Check fluid level and condition
Tappet oil screen	Clean
Primary chain drain plug	Clean
Spark plugs	Replace
Ignition timing	Check/adjust
Sensor air gap (1978-1979)	Check/adjust
Carburetor	Check/adjust idle and fast idle
Fuel valve	Clean tank screen
Clutch	Check/adjust free play
Throttle/choke cables	Check/adjust
Speedometer drive	Grease, if so equipped
Control cables	Lubricate
Lever and pedal pivots	Lubricate
Seat post and/or linkage bushings	Lubricate
EVERY 5,000 MILES or YEARLY	
Transmission oil	Change
Fork oil	Change
Throttle grip sleeve	Grease
Speedometer cables	Grease
Shock absorber rubber bushings	Inspect/replace
Ignition advance (1978-1979)	Lubricate
Steering	Check/adjust bearing
Swing arm	Check/adjust bearing
EVERY 10,000 MILES or 2 years	
Wheel bearings	Grease
Swing arm pivot	Grease
Final drive belt	Inspect tension/adjust/align, if so equipped
Primary drive belt	Inspect tension/adjust/replace, if so equipped
Compensating sprocket dampers	Lubricate
Clutch hub bearing	Grease

Table 2 TUNE-UP SPECIFICATIONS

Spark plugs	Harley-Davidson No.	Gap
1980 and later	No. 5R6A or 5RL	0.038-0.043 in.
1978-1979	No. 5A6A or 5R6A	0.038-0.043 in.
1976-1977	No. 5-6	0.028-0.032 in.
Breaker point gap		
1978 and later	Not applicable	
1976-1977	0.018 in.	
Idle speed		
Late 1978-on	900 rpm	
1976-early 1978	700-900 rpm	
Fast idle		
Late 1978 on	1,500 rpm	
Mixture screw		
1980 and later	Not adjustable	
Late 1978-1979		
74 cu. in.	1-1/8 turn out	
80 cu. in.	3/4 turn out	
1976-early 1978	7/8 turn out, then set for smoothest idle	

Table 3 TIRE PRESSURES

	Front	Rear
FL Series		
Solo	20 psi	24 psi
With passenger	20 psi	26 psi
FX Series (except FXWG)		
Solo	24 psi	26 psi
With passenger	26 psi	28 psi
FXWG		
Solo	30 psi	26 psi
With passenger	30 psi	28 psi

CAUTION: Maximum pressure for all tires is 36 psi.
NOTE: These pressures are based on 150 lb. rider weight. For each extra 50 lb., add 2 psi at rear, 1 psi at front.

CHAPTER THREE

ENGINE

Engine specifications that have changed for late 1978 and later models are given in **Table 4**.

Torque specifications that have changed for late 1978 and later models are given in **Table 5**.

PREPARATION FOR ENGINE DISASSEMBLY

When installing the primary drive housing cover on models with belt primary drive, it is not necessary for the primary drive housing to be airtight.

CYLINDER HEADS

Rocker Covers

When disassembling the rocker covers on 1980-1981 models, note that there is an added spacer washer under the rocker arm shaft screw (**Figure 2**).

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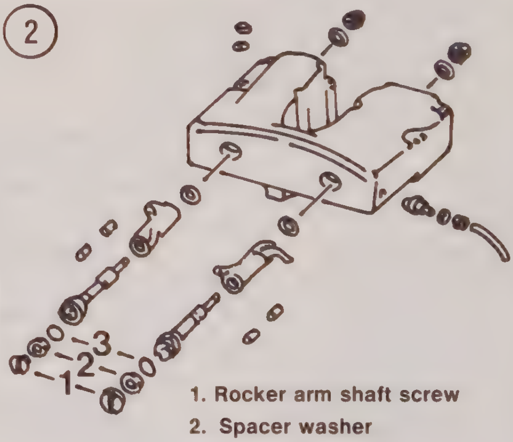

1. Rocker arm shaft screw
2. Spacer washer
3. O-ring

Valve Seals

When removing the valves from the cylinder head, note that a valve seal is used on late 1981 and later models (**Figure 3**). The valve seals should be replaced whenever the valves are removed from the head. The seals cannot be used on earlier valve guides.

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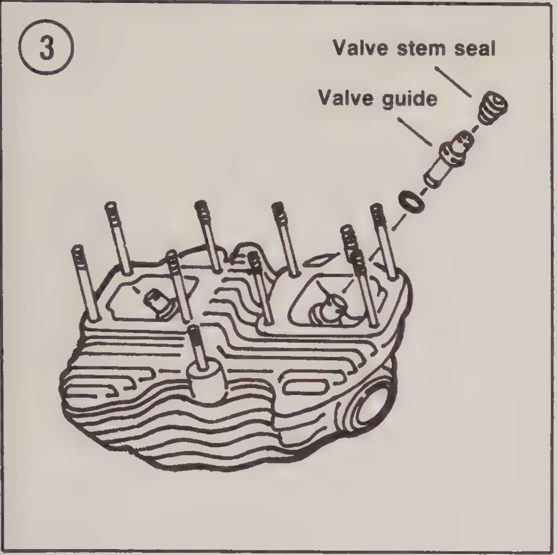
Valve stem seal
Valve guide

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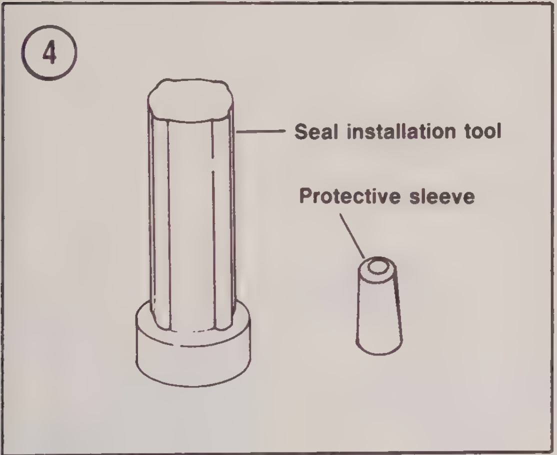
Seal installation tool
Protective sleeve

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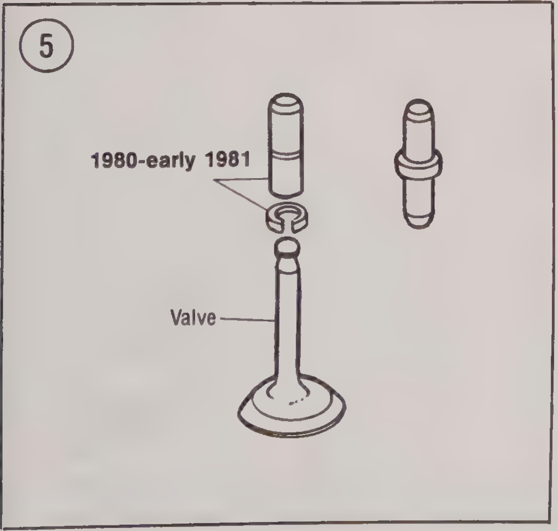
1980-early 1981
Valve

When installing new seals, Harley-Davidson recommends the use of a protective sleeve and special seal installation tool (**Figure 4**). The tools are available from K-Line Industries, Inc., 315 Garden Lane, Holland, Michigan, 49423, ATTN: Order Desk. Order the protective sleeve (part No. 1403F) and seal installation tool (part No. 1429). Place the protective sleeve over the valve stem end and slide the seal down against the guide. Use the installation tool to tap the seal squarely and firmly down onto the guide.

CAUTION

If the seal is not seated squarely and firmly, it will come off when the engine is running. Do not remove the valve after the seal is in place or you will damage the seal.

Valve Guides

On some models, the cast iron valve guides are grooved and have a snap ring to position the guide in the cylinder head (**Figure 5**). Install the snap ring before pressing the guide into the head. No gasket is used under this type of guide.

Valve Seat Angles

In late 1980, an "interference-type" valve seat angle was introduced. See **Figure 6** or

6

1983 AND EARLIER

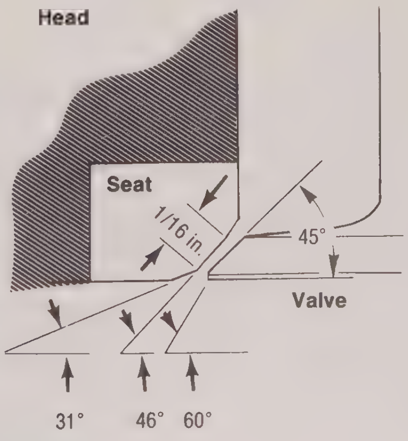
Head
Seat
1/16 in.
45°
Valve
31°
46°
60°

Figure 7. The 45 degree valve head angle and 46 degree seat angle tend to give tighter valve sealing.

Piston Measurement (Late 1983 and Later Models)

The pistons on these models are now ground to a barrel shape. Measuring piston diameter with a micrometer will give inaccurate readings. When determining piston clearance on all late 1983 and later models, Harley-Davidson recommends you measure the bore diameter and cross-reference this diameter with the piston sizes in **Table 6**.

PUSHROD ASSEMBLY

In late 1978, the pushrod assembly was fitted with O-ring seals in place of the cork washers used on earlier models. In late 1981 the O-ring seals were replaced by square cross-section "quad" seals.

PISTONS AND CYLINDERS

Cylinder and Piston Removal

On late 1981 and later models, an oil fitting and hose are used to scavange excess oil from the tappet guides while the piston is moving up (**Figure 8**). Disconnect the hoses before removing the cylinders. If the fittings are removed from the tappet guides, new O-rings should be installed.

Piston Rings

The second piston ring's lower inner edge is tapered on 80 cu. in. engines from case number 1479-345-165 on and on 74 cu. in. engines from case number 179-023-001 on. See **Figure 9**. This type of ring has a dot or dash marked on the side that must face up. Both rings may have one side stamped "TOP." The tapered ring provides better compression sealing than the older chrome-edged ring.

Pistons

On 1980 models, special low-compression pistons are available when necessary to cope

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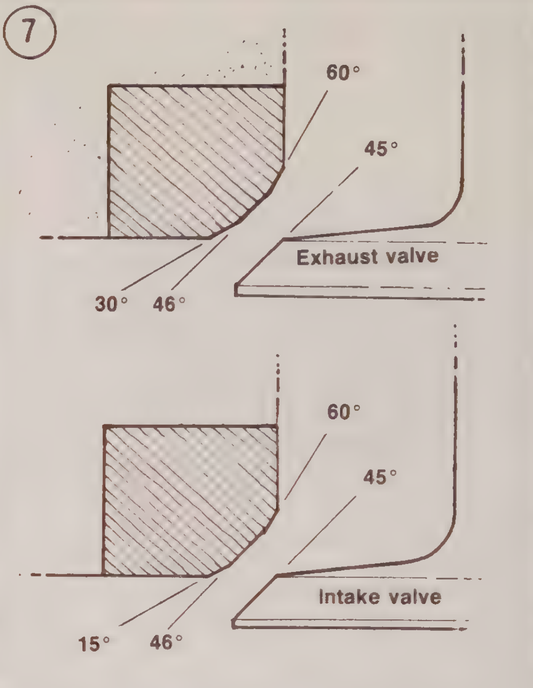

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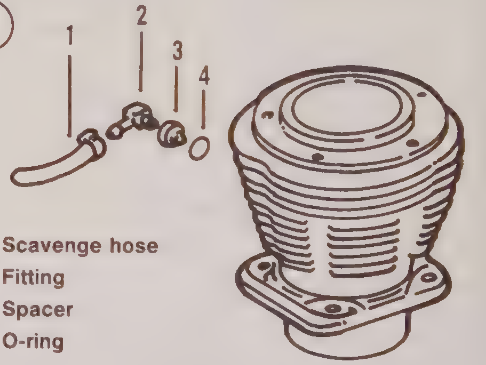
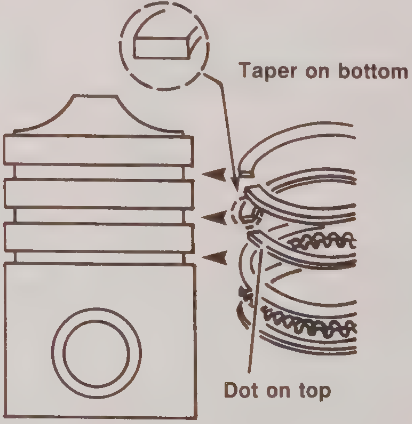


1. Scavenge hose
2. Fitting
3. Spacer
4. O-ring

9



with low-octane fuel. See your dealer if you have knocking or detonation problems. You may want to lower the compression ratio or retard the ignition timing.

If you have an early 1980 74 cu. in. FLH or FXE with an engine number between 10827 J0 and 19714 J0, check with your Harley-Davidson dealer to make sure your bike has had the correct pistons installed. Some (but not all) of those engines were assembled with faulty pistons that could accelerate piston/cylinder wear.

CAM GEAR

Starting with late 1983 models, the cam profile on the rear cylinder intake cam gear was changed enough so that the cam gear is not interchangeable with early 1983 and earlier models. An identification mark is stamped on the rear cylinder cam gear intake lobe. Early 1983 and earlier rear cylinder intake cam gears are marked with the letter "H." Late 1983 and later rear cylinder intake cam gears are marked with the letter "S."

CRANKSHAFT

Beginning with engines built in 1979, the factory began using Loctite 640 Retaining Compound on the tapered portions of the crankpin, sprocket shaft and pinion shaft. At the same time, the crank pin lockplates were eliminated. Disassembly of the crankshaft will require heating the flywheel around the tapers to 450° F with a gas torch. Do not overheat. The shafts can then be loosened by striking their ends with a soft metal hammer.

If you assemble the crankshaft without this locking agent, you run the risk of spinning or slipping the flywheels out of alignment.

The 640 Loctite may be available at your dealer or at an industrial bearing supply house. A commonly available equivalent is Loctite "Sleeve Retainer," product number 27. It should not be used with a primer and the cure time is about 12 hours. Wipe the tapers clean and dry inside and outside and apply only 2 drops of retaining compound on each taper, on opposite sides of the taper. Do not use heat to speed the cure or the bond will be weakened.

Table 4 ENGINE SPECIFICATIONS (LATE 1978 AND LATER)

Breather gear end play	0.001-0.016 in.
Cam gear end play	0.001-0.016 in.
Compression ratio	
74 cu. in.	8:1
80 cu. in.	
Late 1978-1980	8:1
1981 and later	7.4:1
Crankshaft end play	0.001-0.004 in.
Flywheel end play	
1980-1981	0.001-0.006 in.
1982 and later	0.001-0.004 in.
Piston/cylinder clearance	0.002-0.0025 in.
Piston ring compression ring end gap	
Late 1983 and later	0.008-0.015 in.
Valve spring free length, new	
Late 1981 and later	
Outer	1.78 in.
Inner	1.56 in.
Valve stem/guide clearance	
Late 1981 and later	
Intake	0.0014-0.0031 in.
Exhaust	0.0009-0.0026 in.

Table 5 TORQUE SPECIFICATIONS (LATE 1978 AND LATER)

Crankpin nuts	
Late 1978 and later	200 ft.-lb.
Gear shaft nut	
Late 1978-early 1981	140 ft.-lb.
Late 1981 and later	155 ft.-lb.
Sprocket shaft nut	
Late 1978-early 1981	400 ft.-lb.
Late 1981 and later	300 ft.-lb.

Table 6 PISTON SELECTION (LATE 1983 AND LATER)

Cylinder bore diameter	Piston
3.4980 in. ±0.0002 in.	Standard
3.5030 in. ±0.0002 in.	0.005 in. o.s.
3.5080 in. ±0.0002 in.	0.010 in. o.s.
3.5180 in. ±0.0002 in.	0.020 in. o.s.
3.5280 in. ±0.0002 in.	0.030 in. o.s.

CHAPTER FOUR

CLUTCH, PRIMARY DRIVE AND TRANSMISSION

CLUTCH CONTROL ADJUSTMENT (LATE 1979 AND LATER)

The new shifter cover on late 1979 and later models is used as a measurement base when the cable sleeve adjuster no longer provides proper free play at the hand lever. Turn the clutch adjusting screw (**Figure 10**) until the distance between the transmission lever and the shifter boss is 13/16 in. (**Figure 11**); then adjust free play at the hand lever.

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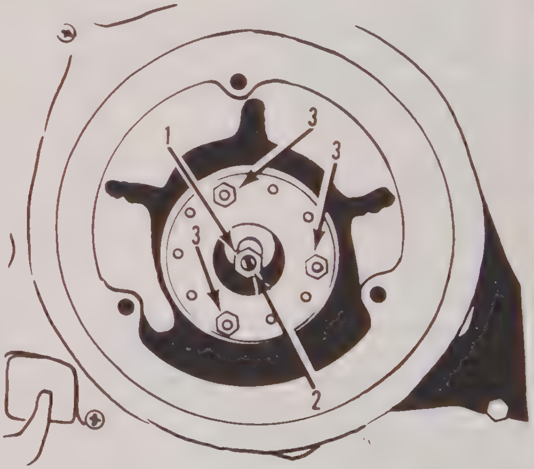


1. Clutch pushrod adjusting screw lock
2. Clutch adjusting screw
3. Clutch spring adjusting nuts

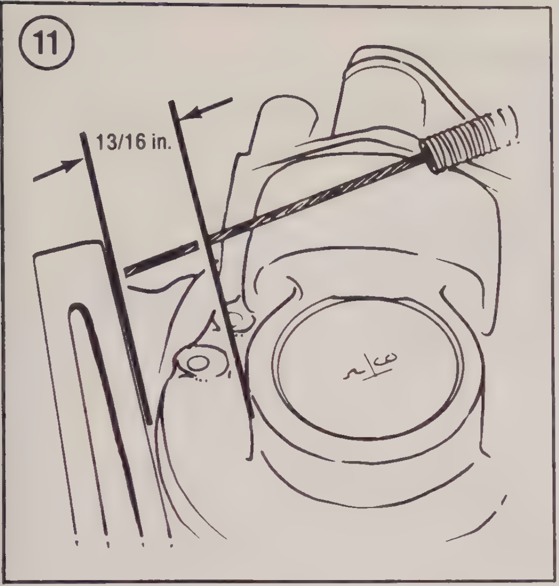
ELECTRIC STARTER DRIVE

Chain-drive Models

On models with chain drive to the rear wheel, a gasket is added outside the starter drive oil deflector on late 1980 and later models.

Belt-drive Models

On models with belt drive to the rear wheel, a new electric starter drive is used to provide belt clearance. See **Figure 12**.



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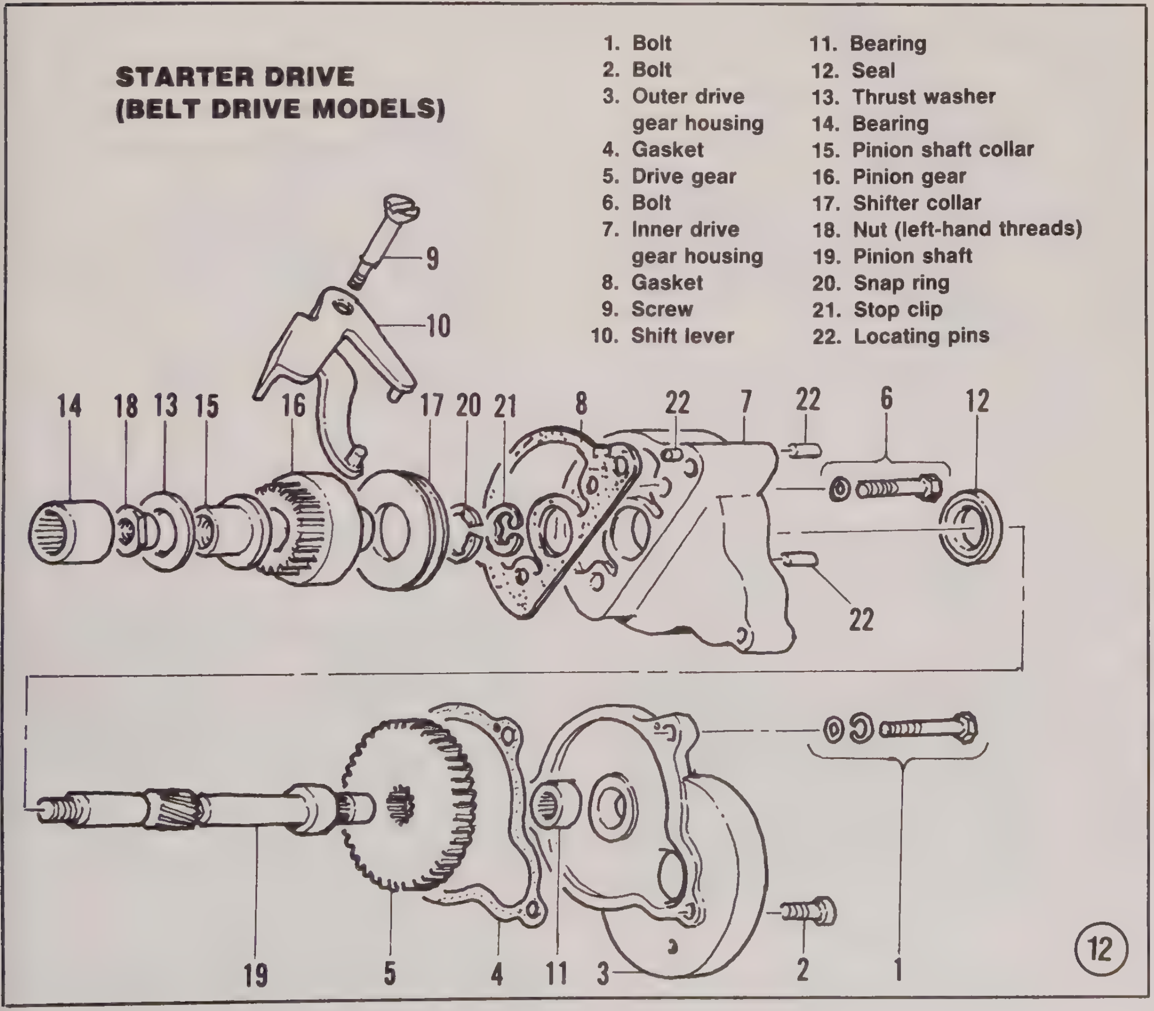
PRIMARY CHAIN (1984 MODELS)

Disassembly

Procedures used to disassemble the primary chain assembly remain the same as for 1983 and earlier models, except that the cup (3, **Figure 13**) between the sliding cam and cover is no longer used.

TRANSMISSION SHIFTER (LATE 1979 AND LATER)

A rotating plate-type shifter replaces the drum-type shifter used on earlier models. The shift forks are also different, but the transmission shafts are the same. **Figure 14** is an exploded view of the plate-type shifter. The bracketed ( ) numbers in the text



STARTER DRIVE (BELT DRIVE MODELS)

1. Bolt
2. Bolt
3. Outer drive gear housing
4. Gasket
5. Drive gear
6. Bolt
7. Inner drive gear housing
8. Gasket
9. Screw
10. Shift lever
11. Bearing
12. Seal
13. Thrust washer
14. Bearing
15. Pinion shaft collar
16. Pinion gear
17. Shifter collar
18. Nut (left-hand threads)
19. Pinion shaft
20. Snap ring
21. Stop clip
22. Locating pins

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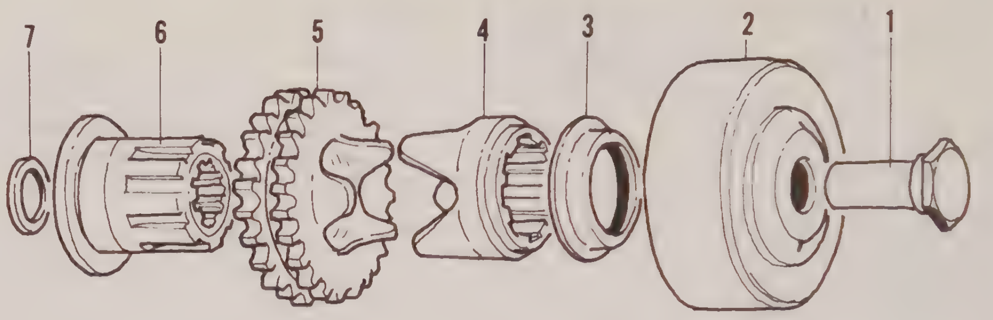
⑬ **COMPENSATING SPROCKET**



1. Nut
2. Cover
3. Cup (1983 and earlier)
4. Sliding cam
5. Compensating sprocket
6. Shaft extension
7. Spacer

correspond to the numbered callouts in the figure.

Plate Shifter Disassembly

1. Remove the 5 bolts (18) and washers attaching the cover to the transmission; the bolt from the hole shown with an arrow in **Figure 14** can be loosened, but not removed. To remove the bolt, you must first remove the shifter shaft cover (24).
2. Remove the neutral indicator switch (15) and washer.
3. Remove the 3 bolts (10 and 27) and washers and the shifter shaft cover (20) and gasket.
4. Fold down the tabs on the lockplate (**Figure 15**) and remove the 2 bolts and the gear detent plunger assembly (32, 33, 34 in **Figure 14**).
5. To remove the shift cam and pawl assembly (44, 39, 42), drill a hole in the plug on top of the cover (17) and pry the plug out (you'll have to install a new plug later). Remove the circlip (35) and thrust washer from the top, then pull the shift cam and pawl assembly out from the bottom.
6. To assemble, reverse the disassembly procedure. Note the following:
   a. Grease the pawl carrier springs (28) and oil the other parts.
   b. Install a new plug (17), using sealant. An automotive Welch plug of the proper size may be used. Hit the center of the plug with a ball peen hammer to expand and secure it.
   c. The cover hole indicated with an arrow in **Figure 14** must have its bolt (20) inserted before installing the shifter shaft cover (24).

Plate Shifter Inspection

1. Check all parts for wear or cracks, especially the shift pawls (42) and stops (29, 30).
2. Check for excessive play between the ball on the shifter shaft (23) and the pawl carrier (39).
3. Replace any pivoting parts whose holes are worn out of round.
4. If possible, compare the length of the pawl springs (40) and carrier springs (28) with new ones and replace any that have stretched or sagged.
5. Check that the neutral switch plunger slides freely in the switch body (15).

SHIFTER FORKS

In 1978 a lock ring replaced the set screw securing the shifter fork shaft. From late 1979

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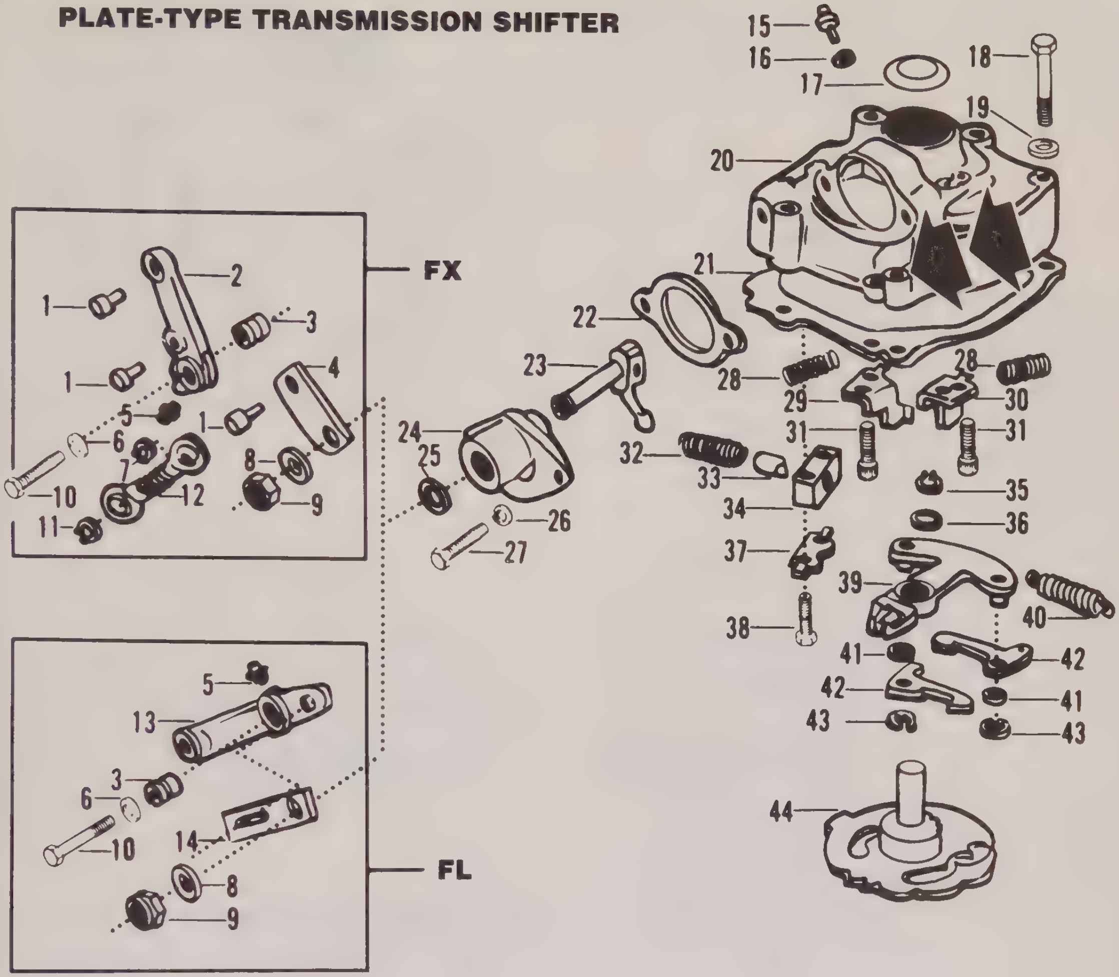
PLATE-TYPE TRANSMISSION SHIFTER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FL
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1. Pivot pin (3) (FX)
2. Shift lever (FX)
3. Bushing
4. Shift lever arm (FX)
5. Grease fitting
6. Washer (2)
7. Retaining ring (2) (FX)
8. Washer
9. Nut
10. Bolt
11. Retaining ring
12. Shift linkage arm (FX)
13. Shift lever (FL)
14. Shift lever arm (FL)
15. Neutral indicator switch
16. Washer
17. Plug
18. Bolt (5)
19. Washer (5)
20. Shift cover
21. Gasket
22. Gasket
23. Shifter shaft
24. Shifter shaft cover
25. Oil seal
26. Lockwasher (2)
27. Bolt (2)
28. Pawl carrier spring
29. Rear shifter pawl stop
30. Front shifter pawl stop
31. Socket head screw (4)
32. Spring
33. Plunger
34. Plunger body
35. Retaining ring
36. Thrust washer
37. Lock plate
38. Bolt (2)
39. Pawl carrier
40. Shifter pawl spring
41. Spacer (2)
42. Pawl (2)
43. Retaining ring
44. Shifter cam

the parts are the same in each group but the order is reversed (**Figure 16**).

Disassembly, inspection and assembly are the same as for earlier models, but a new tool (H-D part No. 96385-78) is required to check fork side clearance. This job is best left to a Harley-Davidson shop.

COUNTERSHAFT

In late 1978 the countershaft-to-drive gear end bearing clearance was increased to 0.0025-0.020 in. and the gear end play minimum was reduced to 0.004-0.012 in.

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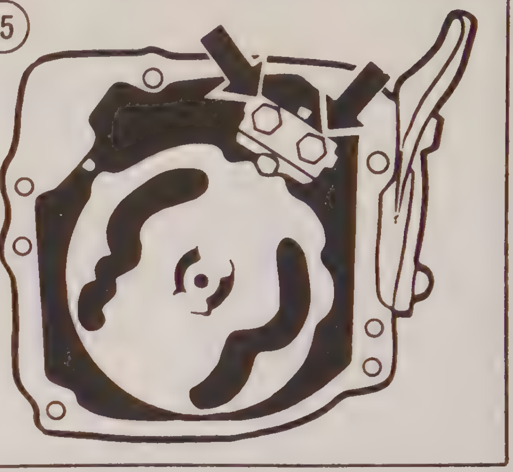

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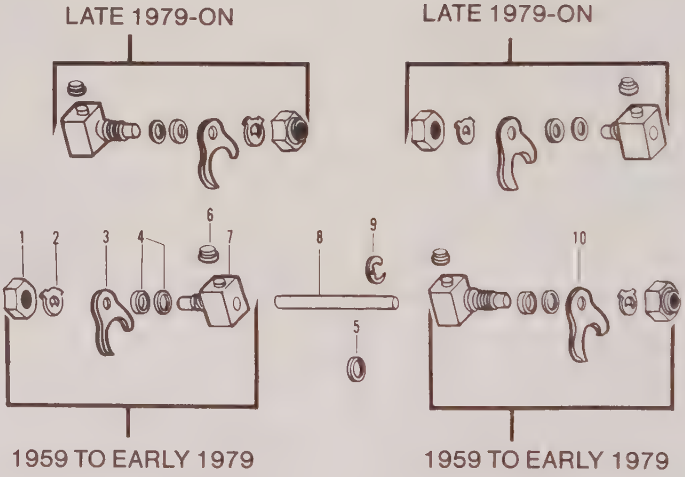

SHIFTER FORKS

1. Nut (2)
2. Lockwasher (2)
3. Shifter fork (countershaft)
4. Spacing shim (variable number) (0.007 in. and 0.014 in.)
5. Oil seal
6. Shifter finger rollers
7. Shifter finger (2)
8. Shifter fork shaft
9. Lock ring
10. Shifter fork (main shaft)

CHAPTER FIVE

CARBURETOR

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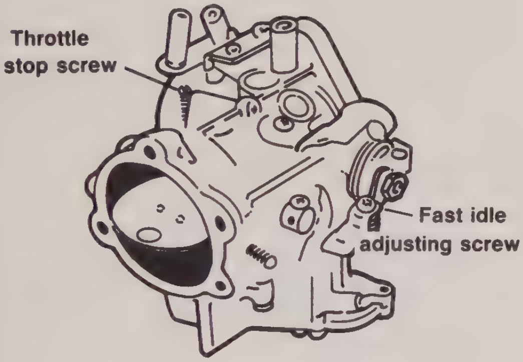
CARBURETOR (1981-ON)



KEIHIN CARBURETOR

The Keihin carburetor was introduced in 1976. In late 1978 an idle mixture limiting cap was added and in 1980 the idle mixture screw was permanently sealed inside the carburetor body. Only idle speed and fast idle are adjustable on 1980 and later models, but an optional high-altitude jet kit is available from your dealer if you have driveability problems when riding above 4,000 feet.

Adjustment (Late 1978 and Later)

1. See **Figure 17** or **Figure 18**. Start the engine, warm it up, check that the choke is OFF, then set the idle speed at 900 rpm with the throttle stop screw.

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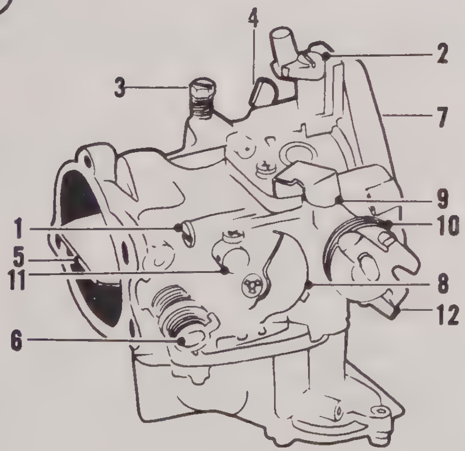

CARBURETOR (LATE 1978-1980)

1. Fast idle adjusting screw
2. Limiter cap (late 1978-1979)
3. Throttle stop screw
4. Throttle lever
5. Choke plate
6. Choke lever shaft
7. Mounting flange
8. Accelerating pump lever
9. Rocker arm
10. Rocker arm spring
11. Intermediate lever
12. Fast idle cam

2A. On 1980 and later models, the idle mixture is set and sealed at the factory. It is not intended to be adjustable.

2B. On late 1978-1979 models, the idle mixture screw has a limiter cap on it. Turn the limiter cap out (counterclockwise) to the leanest setting that gives a smooth idle.

NOTE

The low-speed mixture screw limiter cap should not be removed unless the carburetor is being disassembled for cleaning. If the cap has been removed, turn the idle mixture screw in (clockwise) until it seats lightly, then back it out 1 1/8 turn on 74 cu. in. bikes and 3/4 turn on 80 cu. in. bikes. Install the limiter cap in its center position.

NOTE

Turning the idle mixture screw to the right (clockwise) leans the mixture. Turning it to the left (counterclockwise) richens the mixture.

3. Rev the engine a couple times and see if the idle speed is constant. If necessary, readjust the idle speed to 900 rpm.

CAUTION

Do not set the idle at the lowest possible speed. The engine will not accelerate from idle easily, and it will have excessive bearing wear and oil consumption.

4. Pull the choke knob out to its first detent and turn the fast idle screw to set fast idle at 1,500 rpm. Push the choke knob all the way in and check that idle drops to 900 rpm.

Adjustment (1976-early 1978)

1. See **Figure 19**. Turn the low-speed mixture screw in (clockwise) until it seats lightly, then back it out 7/8 turn.

NOTE

Turning the idle mixture screw to the right (clockwise) leans the mixture. Turning it to the left (counterclockwise) enriches the mixture.

2. Start the engine, warm it up, check that the choke is OFF, then set the idle speed at 700-900 rpm with the throttle stop screw.
3. Turn the idle mixture screw in or out slightly, as required, to get the highest smooth idle speed. The best performance will usually result if the mixture is slightly rich (screw turned in a little).
4. Rev the engine a couple times and see if the idle speed is constant. Readjust the idle speed, if necessary, to 700-900 rpm.

CAUTION

Do not set the idle at the lowest possible speed. The engine will not accelerate from idle easily and it will have excessive bearing wear and oil consumption.

5. Adjust the accelerator pump volume, if necessary, with the pump adjust screw. The standard setting is about 1/4 in. between the tip of the screw and its stop. Backing the screw out increases pump volume. The pump stroke may also be adjusted by moving the rocker arm spring to other than the standard center notch in the rocker arm.

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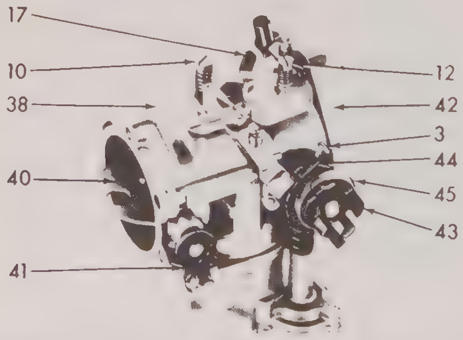

CARBURETOR
ADJUSTMENT
(1976-EARLY 1978)

3. Screw
10. Throttle stop screw
12. Low speed mixture screw
17. Throttle lever
38. Fitting
40. Choke plate
41. Choke lever
42. Mounting flange
43. Accelerator pump lever
44. Rocker arm
45. Rocker arm spring

Removal/Disassembly

See **Table 7** for standard carburetor jet sizes on emission controlled motorcycles.

WARNING

Some fuel may spill during this procedure. Work in a well-ventilated area at least 50 ft. from any sparks or flames, including gas appliance pilot lights. Do not smoke in the area. Have a BC rated fire extinguisher handy.

1. Remove the air cleaner assembly.
2. Close the fuel tap and disconnect the fuel line at the carburetor.
3. Disconnect the choke and throttle cables at the carburetor.
4. Remove the carburetor mounting nuts, washers and the carburetor.
5. See **Figure 20**, **Figure 21** or **Figure 22** for carburetor disassembly and assembly.

NOTE

Do not try to remove the throttle butterfly valve from its shaft. These parts are precisely matched to the carburetor body and fuel bypass ports. Replace the carburetor body if the throttle valve is damaged.

Cleaning and Inspection

1. Inspect the float bowl O-ring and replace if damaged. If there is much residue in the float bowl, the carburetor body should be cleaned thoroughly.
2. Thoroughly clean and dry all parts. If a special carburetor cleaning solution is used, all non-metal parts must be removed (gaskets, O-rings, etc.).
3. Blow out all the passages and jets with air. Don't use wire to clean any of the orifices; wire will enlarge them.

CAUTION

Do not apply compressed air to a carburetor with hollow floats inside the carburetor. The floats could collapse.

4. Check the cone of the float valve and replace it if scored or pitted.
5. If the float is brass, shake it to see if there is any fuel in it. If there is, install a new float.
6. Examine the end of the idle mixture screw for grooves or roughness. Replace it if damaged. Replace a worn O-ring.
7. Inspect the accelerator pump diaphragm for pinholes or other damage. Replace it if necessary. Make sure the pump rod is not bent and that its boot is in good condition.
8. Make sure the overflow tube on the bottom of the float bowl is not blocked.

Assembly/Installation

Assembly and installation are the reverse of removal and disassembly. Note the following.

1. Tighten the jets securely, but be careful not to strip their threads.
2. Check and adjust the float height (**Figure 23**). Bend the float lip to adjust.
3. After assembly, turn the carburetor upside-down and listen to be sure the floats are moving freely.
4. Adjust the carburetor as described in this section of the supplement.

CAUTION

*Make sure the carburetor mounts are **airtight**. Air leaks can cause severe engine damage from a lean mixture or intake of dirt.*

Troubleshooting

Table 8 lists symptoms of possible carburetor problems and possible causes.

Some early 1976 Keihin carburetors had an accelerator pump rod that was too long, with no free play. If you have an early Keihin carburetor with symptoms of flooding or unstable idle, remove the air cleaner cover and check for fuel leakage at the accelerator pump nozzle when the engine is warm and idling. If there is leakage, shorten the accelerator pump rod to 2.34 inches long. Don't make it any shorter or the pump won't inject the proper amount of fuel.

AIR CLEANER

Air cleaners on 1980 and later models have a plugged drain hose routed down between the engine and transmission. The hose plug should be removed at regular intervals to allow accumulated fluids to drain.

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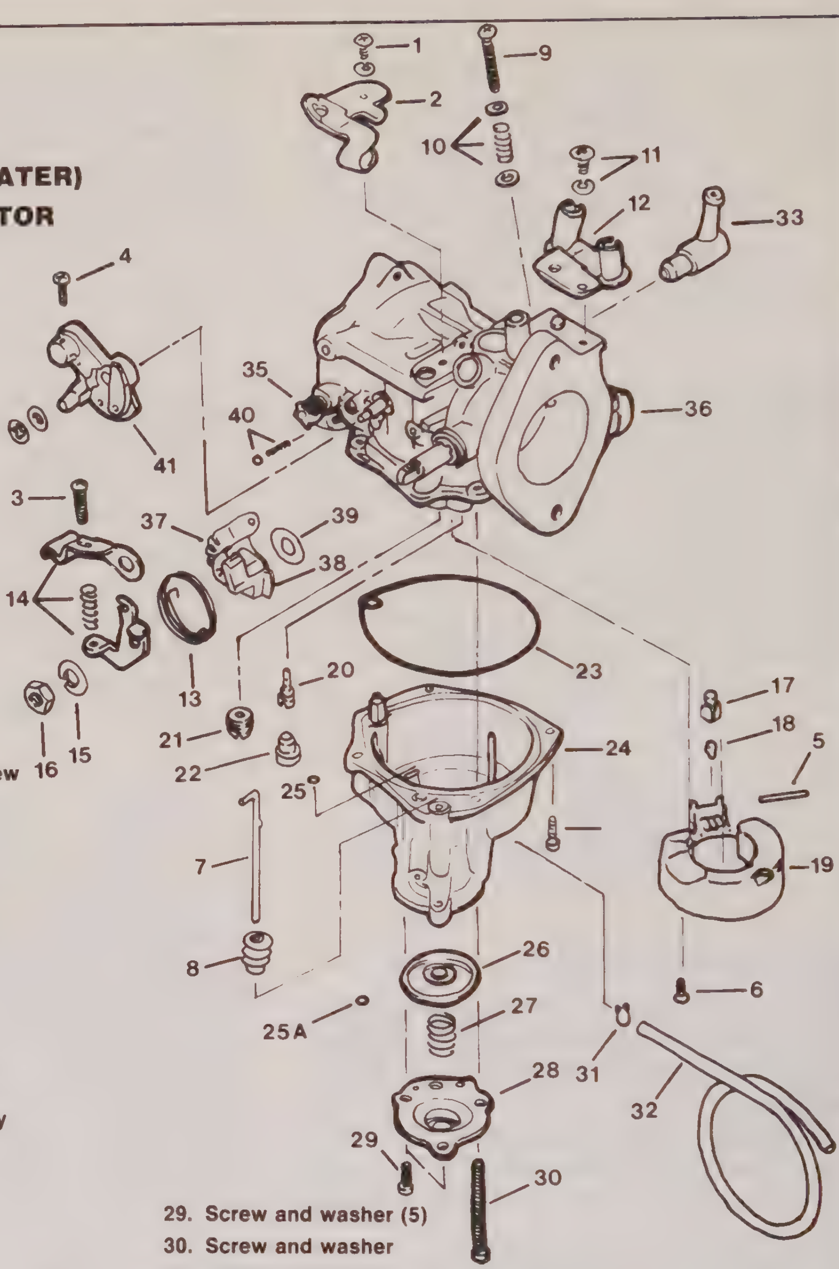
(1981 AND LATER)
CARBURETOR



1. Screw and washer
2. Choke cable bracket
3. Fast idle adjusting screw
4. Choke cable screw
5. Float pin
6. Float retaining screw
7. Accelerating pump rod
8. Rubber boot
9. Throttle stop screw
10. Spring and washers
11. Screw and washer
12. Throttle cable bracket
13. Spring
14. Fast idle cam assembly
15. Lockwasher
16. Nut
17. Inlet valve
18. Clip
19. Float assembly
20. Low speed jet
21. Main jet
22. Plug
23. Rubber gasket
24. Float bowl
25. O-ring (mid range port)(1981-1983)
25A. O-ring (accelerating pump)
26. Accelerating pump diaphragm
27. Accelerating pump spring
28. Accelerating pump housing
29. Screw and washer (5)
30. Screw and washer
31. Overflow line clip
32. Overflow line
33. Fuel inlet fitting
34. Choke plate (not shown)
35. Choke lever shaft
36. Mounting flange
37. Accelerating pump rod hole
38. Rocker arm
39. Washer
40. Choke detent ball and spring
41. Fast idle cam

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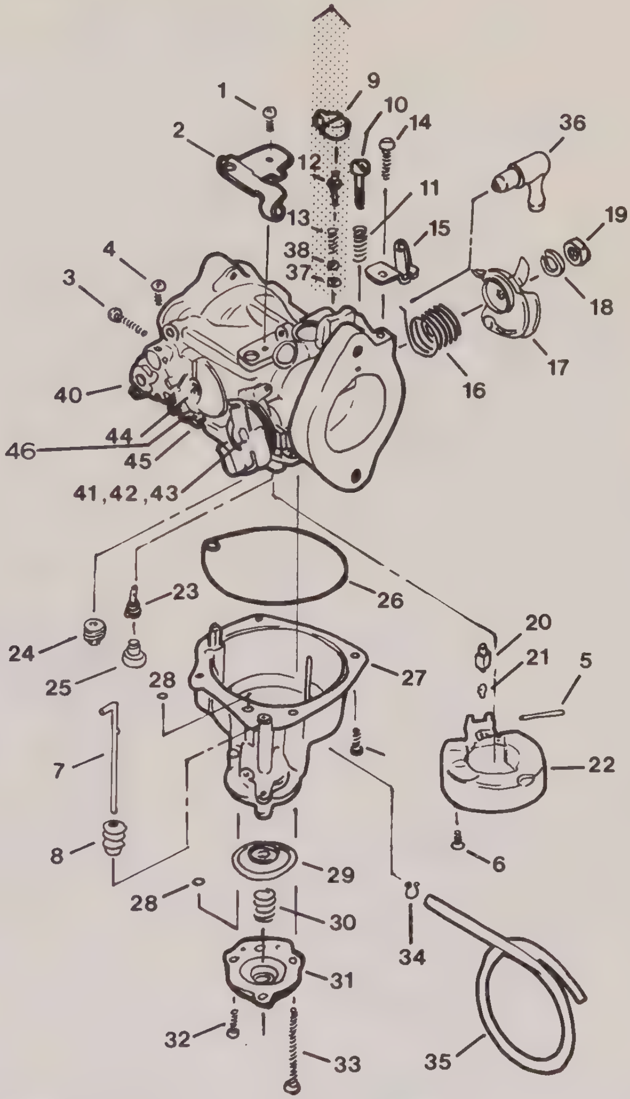
CARBURETOR
(LATE 1978-1980)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1. Screw and washer
2. Bracket
3. Fast idle adjusting screw
4. Screw
5. Float pin
6. Screw
7. Rod
8. Boot
9. Limiter cap
10. Throttle stop screw
11. Spring
12. Idle mixture screw
13. Spring
14. Screw and washer
15. Bracket
16. Spring
17. Throttle lever
18. Washer
19. Nut
20. Inlet valve
21. Clip
22. Float assembly
23. Low speed jet
24. Main jet
25. Plug
26. Gasket
27. Float bowl
28. O-ring (2)
29. Diaphragm
30. Spring
31. Housing
32. Screw and washer (5)
33. Screw and washer
34. Clip
35. Hose
36. Fitting
37. O-ring
38. Washer
39. Choke plate (not shown)
40. Choke lever shaft
41. Mounting flange
42. Accelerating pump lever
43. Rocker arm
44. Rocker arm spring
45. Intermediate lever
46. Fast idle cam

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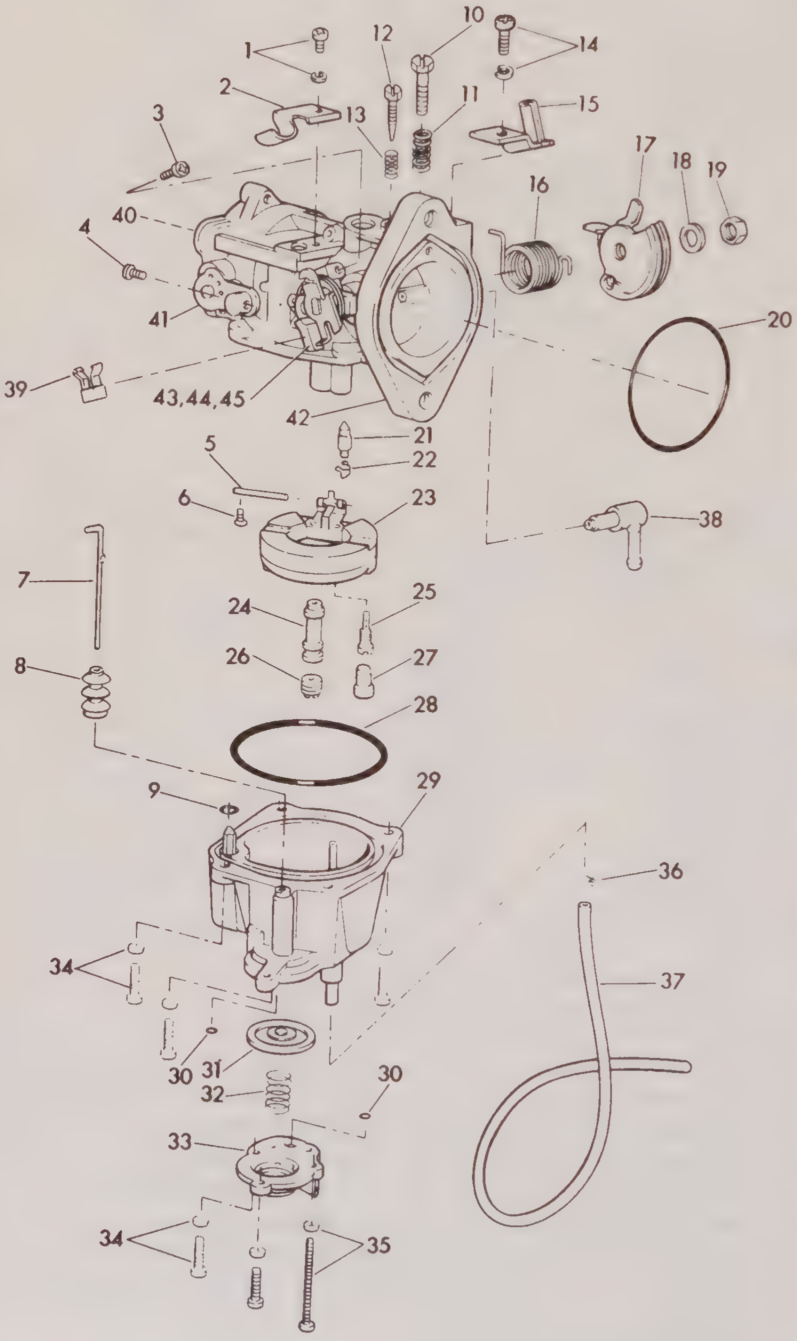
CARBURETOR
(1976-EARLY 1978)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1. Screw and washer
2. Bracket
3. Screw
4. Screw
5. Float pin
6. Screw
7. Rod
8. Boot
9. O-ring
10. Throttle stop screw
11. Spring
12. Low speed mixture screw
13. Spring
14. Screw and washer
15. Bracket
16. Spring
17. Throttle lever
18. Washer
19. Nut
20. O-ring
21. Fuel valve
22. Clip
23. Float assembly
24. Main nozzle
25. Slow jet
26. Main jet
27. Plug
28. O-ring
29. Float bowl
30. O-ring
31. Diaphragm
32. Spring
33. Housing
34. Screw and washer
35. Screw and washer
36. Clip
37. Hose
38. Fitting
39. Spacer (not standard)
40. Choke plate (not shown)
41. Choke lever
42. Mounting flange
43. Accelerator pump lever
44. Rocker arm
45. Rocker arm spring

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CARBURETOR FLOAT SETTING

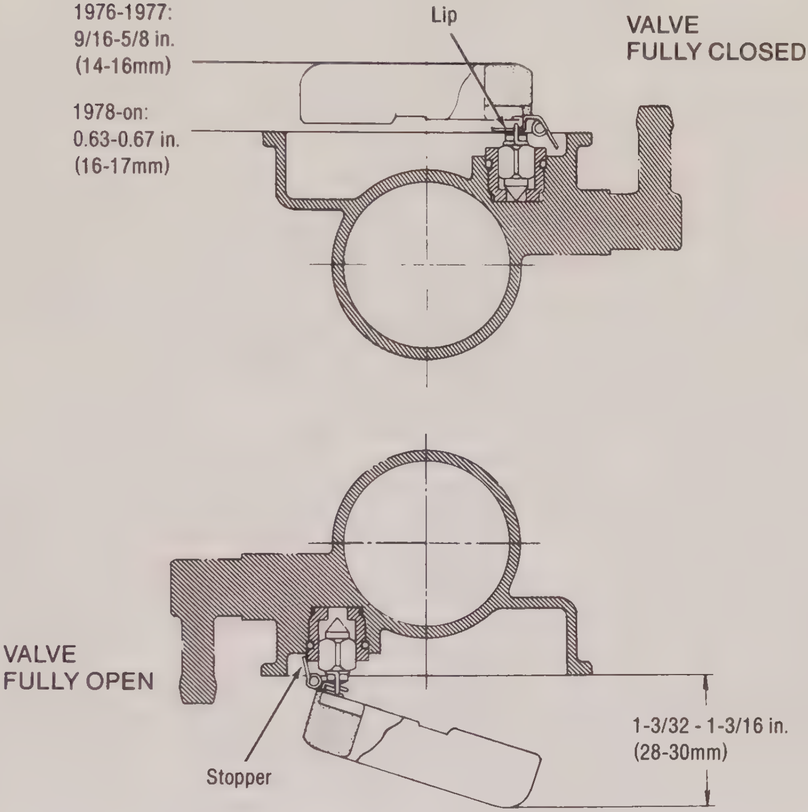
1976-1977:
9/16-5/8 in.
(14-16mm)
1978-on:
0.63-0.67 in.
(16-17mm)
Lip
VALVE
FULLY CLOSED
VALVE
FULLY OPEN
Stopper
1-3/32 - 1-3/16 in.
(28-30mm)

Table 7 CARBURETOR JETS (LATE 1978 AND LATER)

Model	Main jet	Slow jet
FL series	165	70
FX series		
FXE (1982)	165	72
All others	160	72

Table 8 KEIHIN CARBURETOR TROUBLESHOOTING

Symptom	Probable Cause
Hard starting	Choke not operating
	Idle mixture misadjusted
	Air leak at carb mount
	Fuel overflow
Fuel overflows	Worn float needle valve or dirty seat
	Incorrect float level
	Damaged float bowl O-ring or loose float bowl mounting screws
	Damaged float pin or loose locking screw
	Crushed float
Poor idling	Misadjusted
	Worn idle mixture screw
	Blocked jet or port in carb bore
	Air leak at carb mount
	Accelerator pump rod too long or misadjusted
Poor acceleration	Clogged accelerator pump
	Worn accelerator pump diaphragm
	Idle mixture misadjusted
	Clogged slow jet
	Float level too high
Low power overall	Dirty carburetor passages
	Clogged fuel line
	Clogged fuel strainer in tank
	Air leak at carburetor mount
	Dirty air filter
	Loose jets
Poor high speed power	Loose or clogged main jet
	Incorrect float level
	Dirty carburetor passages
Poor fuel economy	Float level too low
	Loose jets
	Clogged bleed tubes on jets
	Choke not opening fully
	Dirty air filter

CHAPTER SIX

ELECTRICAL SYSTEM

HEADLIGHT

A quartz-halogen headlight was introduced in 1982. Replacement is simple, but special care must be taken when handling the lighting element. On models with a removable bulb, do not touch the quartz bulb.

CAUTION

Use a clean cloth to grasp the quartz bulb. Don't handle a quartz bulb with your bare fingers or a dirty rag. They'll leave oil on the bulb and cause it to burn out quickly.

CHARGING SYSTEM

Beginning with 1976 models, the bikes were equipped with a different alternator and a solid state voltage regulator/rectifier. The following service procedures are affected.

Checking Charging System (1976 and Later)

Whenever charging system trouble is suspected, make sure the battery is good before going any further. Check the specific gravity; see *Specific Gravity Testing* in Chapter Six of the basic book. Battery voltage should be above 12 volts. If not, charge the battery. If the battery is okay, make sure all the electrical connections are clean and tight and that the voltage regulator has a good clean ground, then inspect the charging system.

1. See **Figure 24**. Connect a voltmeter, ammeter and carbon pile or rheostat as shown.
2. Start the engine and run it at 2,000 rpm with no load on the rheostat. Observe the voltage.
3. Run the engine at 3,600 rpm; adjust the rheostat so the ammeter reads 5-6 amps. Observe the voltage.
4. Check that the voltmeter reads within the limits shown in **Figure 25** during the previous tests. If the voltage is higher, the regulator is faulty and must be replaced.
5. Run the engine at 2,000 rpm and adjust the rheostat so the voltmeter reads 13.0 volts. Check that the ammeter reads at least 14 amps.
6. If the system output does not meet the tests above, stop the engine and inspect the alternator as follows.

Alternator Test

1. Disconnect the regulator/rectifier and connect an AC voltmeter (0-150 volts) across the stator contact pins in the front of the crankcase on the left side. The meter should read 19-26 volts per 1,000 rpm. If it is much lower, the alternator is defective. Check stator coil resistance.
2. With the engine OFF and an ohmmeter set on a 1 ohm scale, check the resistance between the stator contact pins. The resistance should be about 0.2-0.4 ohms; if not, replace the stator.
3. Set the ohmmeter on the highest scale and check resistance between each contact pin and ground. Resistance should be infinite; if not, replace the stator.

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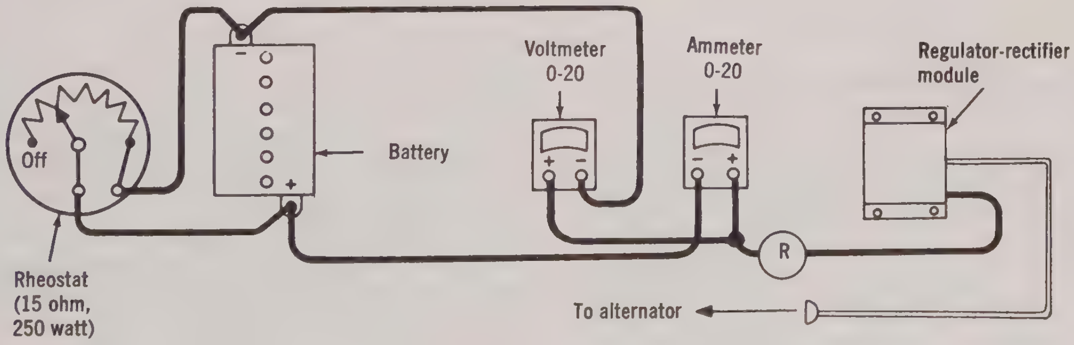

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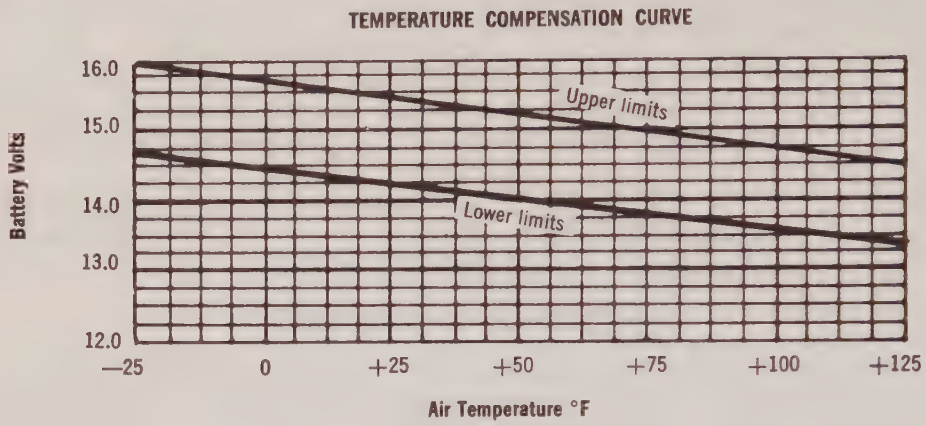

4. If the stator coil resistance is okay, but alternator output is low, the rotor has probably been demagnetized. Replace the rotor.
5. If the alternator is okay, but the system output was below normal in the *System Test*, the regulator is faulty and must be replaced.

Regulator/Rectifier Test

There is no test for the regulator alone. Check the regulator by substituting a known good regulator. If the new unit doesn't solve the problem, the trouble is elsewhere in the system.

IGNITION SYSTEM (1978-1979)

A breakerless electronic ignition system by Prestolite was introduced in 1978. Shown in an exploded view in **Figure 26** and schematically in **Figure 27**, the system differs from breaker point systems in that the mechanical points are replaced by an electronic ignition timer driven off the end of the camshaft. The timer consists of a rotor and sensor. The sensor feeds signals to a control module mounted on the back of the timer inner cover. The timer rotor is mounted on a mechanical flyweight centrifugal advance, just as a point cam would be in a breaker point ignition system.

The rotor has 2 lobes–a small one that fires the front cylinder and a large lobe that fires the rear cylinder. When the ignition switch and kill switch are ON, current flows from the battery through the ignition coil primary winding. Current also flows to the control module. An oscillator in the control module produces a signal that flows through the sensor, creating a magnetic field around it. When the leading edge of a rotor lobe enters the magnetic field, it slightly weakens the field. The control module detects the weakened field and stops current flow through the ignition coil primary winding.

From here on, the Prestolite system operates like a breaker point ignition system. The sudden stoppage of current flow in the ignition coil primary winding causes a rapid collapse of the coil's magnetic field, inducing a high-voltage current in the ignition coil secondary winding and firing the spark plug.

The Prestolite system eliminates breaker point maintenance, but regular inspection of the sensor air gap (the gap between the rotor lobes and the sensor) and of the mechanical advance operation is required.

Sensor Air Gap

Inspect the sensor air gap according to the maintenance schedule (**Table 1**). Adjustment should rarely be necessary.

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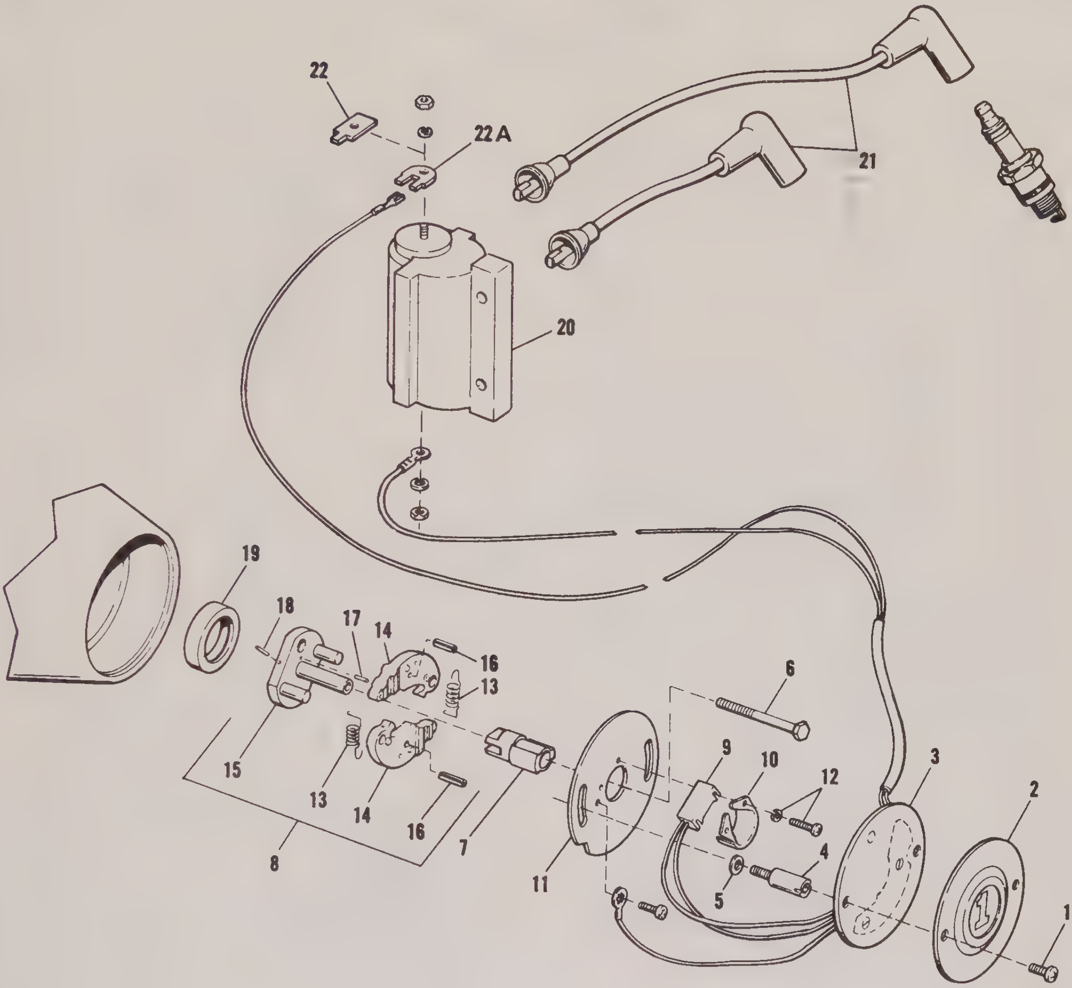

IGNITION SYSTEM
(1978-1979)

1. Cover screw (2)
2. Ignition timer cover
3. Ignition module
4. Timer plate screw (2)
5. Washer (2)
6. Trigger rotor bolt
7. Trigger rotor
8. Advance assembly
9. Sensor
10. Shield
11. Timer plate
12. Screw and washer (2)
13. Flyweight spring (2)
14. Flyweight (2)
15. Advance assembly base
16. Flyweight roll pin (2)
17. Cam stop roll pin
18. Register roll pin
19. Camshaft oil seal
20. Ignition coil
21. Spark plug cable (2)
22. Ignition coil terminal (FL)
22A. Ignition coil terminal (FX)

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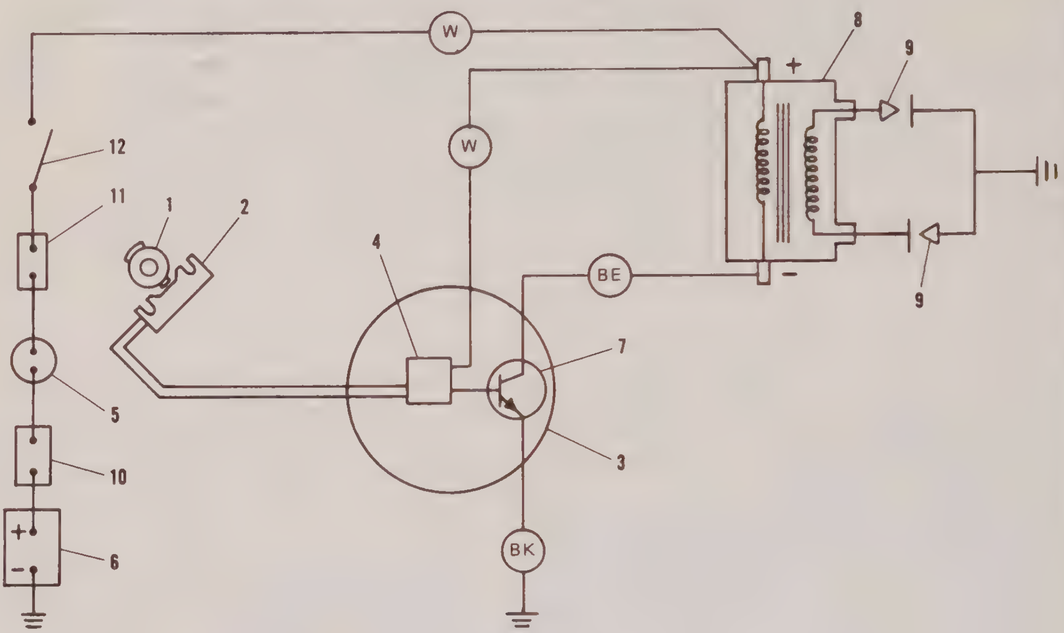
IGNITION SYSTEM
(1978-1979)



1. Trigger rotor
2. Sensor
3. Control module
4. Integrated circuit chip
5. Ignition switch
6. Battery
7. Transistor
8. Ignition coil
9. Spark plug
10. Main circuit breaker
11. Ignition circuit breaker
12. Engine stop switch

1. Remove the spark plug leads at the plugs and remove the spark plugs.
2. Remove the ignition timing cover.
3. Turn the crankshaft and center the wide rotor lobe opposite the sensor (**Figure 28**).
4. Measure the gap between the sensor and the rotor with a flat non-magnetic feeler gauge. It should be 0.004-0.006 in. If the gap is incorrect, loosen the 2 screws that attach the sensor and move the sensor until the gap is correct. Then, holding the sensor steady, tighten the screws.

NOTE

If the engine doesn't run smoothly and spits back because of the standard lean

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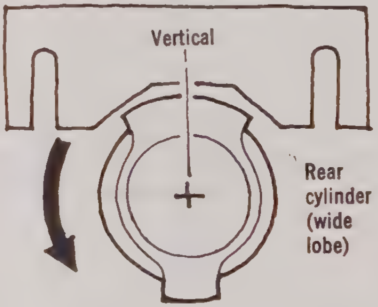

fuel mixture, set the sensor air gap as close to 0.004 in. as possible. This will strengthen the ignition signal for better combustion.

5. Rotate the crankshaft to center the small lobe opposite the sensor. Measure the gap as before and correct it if necessary. Both gaps must be within the specified range.
6. Install the spark plugs and inspect the ignition timing.

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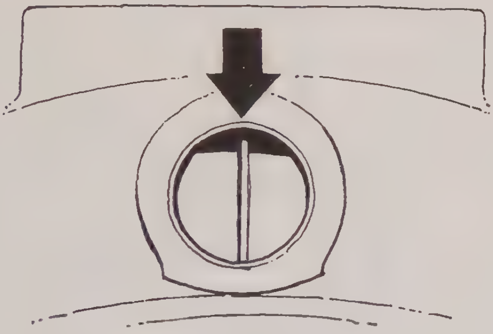

Advance (35°) Timing Mark:
Front cylinder

Dynamic Ignition Timing

Inspect the ignition timing according to the maintenance schedule (**Table 1**). Adjustment should rarely be necessary, unless you want to retard timing to accomodate low-octane fuels.

1. Check the sensor air gap as described in this section of the supplement.
2. Remove the plug from the timing hole on the left side of the engine. A clear plastic viewing plug is available from your Harley-Davidson dealer to minimize oil spray. The part number is 96295-65. Make sure the plug doesn't contact the flywheel.
3. Connect a strobe timing light to the front cylinder's spark plug lead and connect a tachometer according to the instrument manufacturer's instructions.
4. Start the engine and set the idle at 2,000 rpm with the idle stop screw.
5. Shine the light at the timing inspection hole. At 2,000 rpm the front cylinder's advanced mark should appear in the center of the inspection window (**Figure 29**). If the mark is not in the correct position, loosen the timer plate screws (2, **Figure 30**) and turn the timer plate as required by prying the notch (8) with a screwdriver. Observe the front cylinder timing mark with the strobe light and tighten the timer plate screws when timing is correct.
6. Install the ignition timer cover and the inspection hole plug.

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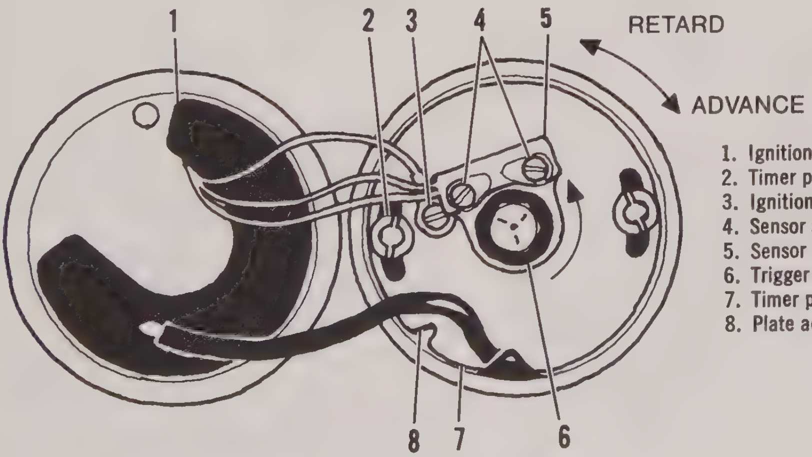


1. Ignition module
2. Timer plate screw (2)
3. Ignition module ground screw
4. Sensor screws
5. Sensor
6. Trigger rotor
7. Timer plate
8. Plate adjusting notch

Static Ignition Timing

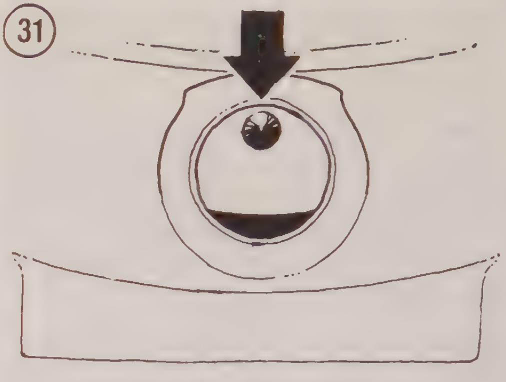
When the engine has been disassembled the timing can be set roughly by hand. This procedure will get the engine running for inspection with a strobe light. Always make final timing adjustments with a strobe light.

1. Remove the ignition timer cover and the inspection plug and lift the front intake valve pushrod cover.
2. Turn the engine to the right (clockwise when viewed from the right side) until the front piston is on its compression stroke, immediately after the intake valve closes. Then, continue to turn the engine slowly until the front cylinder "TDC" mark lines up in the inspection hole (**Figure 31**).
3. With the mechanical advance at its fully retarded position, check the position of the rotor's narrow lobe. Its leading edge should be lined up with the center of the sensor (**Figure 32**). If it is not, loosen the 2 timing plate screws and turn the timing plate slightly until the lobe is positioned correctly. Tighten the timing plate screws.

Ignition Removal/Installation

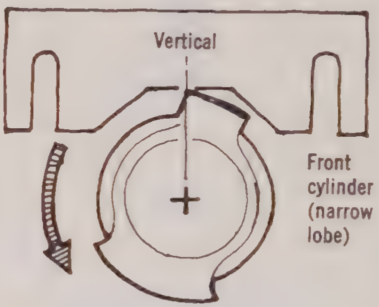
1. See **Figure 26**. Remove the ignition cover and the timing module.
2. Remove the 2 timer plate screws and washers.
3. Unscrew the rotor bolt and remove the rotor.
4. Remove the advance assembly.
5. To disassemble the sensor and shield from the timing plate, remove the screws that hold them in place.
6. To disassemble the advance mechanism, unhook the springs from the pivot pins and remove the weights with the springs attached. Don't remove the springs unless they are being replaced with new ones. See **Figure 33**.
7. Reverse the procedure above to assemble and install the ignition. Lubricate the advance mechanism pivots with WD-40 or Loctite "Anti-Seize." Make sure the timing rotor is seated squarely on the shaft. Refer to *Sensor Air Gap* and *Static Ignition Timing* in this section of the supplement chapter for adjustment.

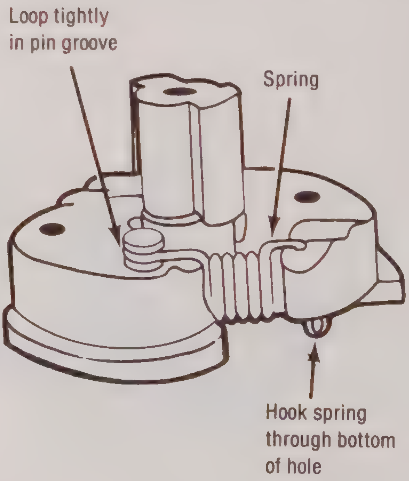
(31)



Retarded (3° BTDC) Position of Piston
Top center mark on flywheel front cylinder

(32)




Loop tightly in pin groove
Spring
Hook spring through bottom of hole

(33)

Ignition Coil

The ignition coil may be checked for resistance with an ohmmeter. If the readings do not correspond to those given in **Table 9**, the coil should be replaced.

Spark Plug Cables

The spark plug cables are resistor-type with a carbon/fabric core. Use care when disconnecting the cables from the spark plugs, in order to prevent core damage. Exact replacement cables must be used to enable the transistorized ignition to operate correctly.

IGNITION SYSTEM (1980 AND LATER)

In the Magnavox full electronic advance system introduced in 1980, an inductive pickup timing sensor feeds timing signals to a "black box" timing control module. See the exploded view in **Figure 34** and the schematic diagram in **Figure 35**.

The microprocessor control module is mounted above the voltage regulator, in front of the engine. The control module computes both ignition timing advance and ignition coil dwell time, eliminating the need for mechanical advance inspection and lubrication and minimizing battery drain.

NOTE

On 1980, early-1981 models, the control module shuts off current to the ignition coil 4 seconds after the ignition switch is turned ON. If the engine is not started within that time, the module must be reset by turning the ignition switch OFF and ON again. Later ignition modules allow 6 seconds for the engine to be started.

The timing sensor is triggered by the leading and trailing edges of the 2 rotor slots shown in **Figure 35**. As rpm increases, the control module "steps" the timing in 3 stages of advance. See **Table 10**.

Dynamic Ignition Timing Inspection

Inspect the ignition timing according to the maintenance schedule (**Table 1**). Adjustment should rarely be necessary, unless you want to retard timing to accomodate low-octane fuels.

1. Remove the plug from the timing hole on the left side of the engine. A clear plastic viewing plug is available from your Harley-Davidson dealer to minimize oil spray. The part number is 96295-65. Make sure the plug doesn't contact the flywheel.
2. Connect a strobe timing light to the front cylinder's spark plug lead and connect a tachometer according to the instrument manufacturer's instructions.
3. Start the engine and set the idle at 2,000 rpm with the throttle stop screw.
4. Shine the light at the timing inspection hole. At 2,000 rpm the front cylinder's advance mark should appear in the inspection window. **Figure 29** shows the advance mark for early 1980 engines up to engine number 1480-128-001. **Figure 36** shows the single drilled dot that shows full advance for the front cylinder on later engines. The double "figure 8" drilled marks represent full advance for the rear cylinder. If the proper mark does not align, adjust the timing as described in this section of the supplement.
5. Reset idle speed and install the timing hole plug.

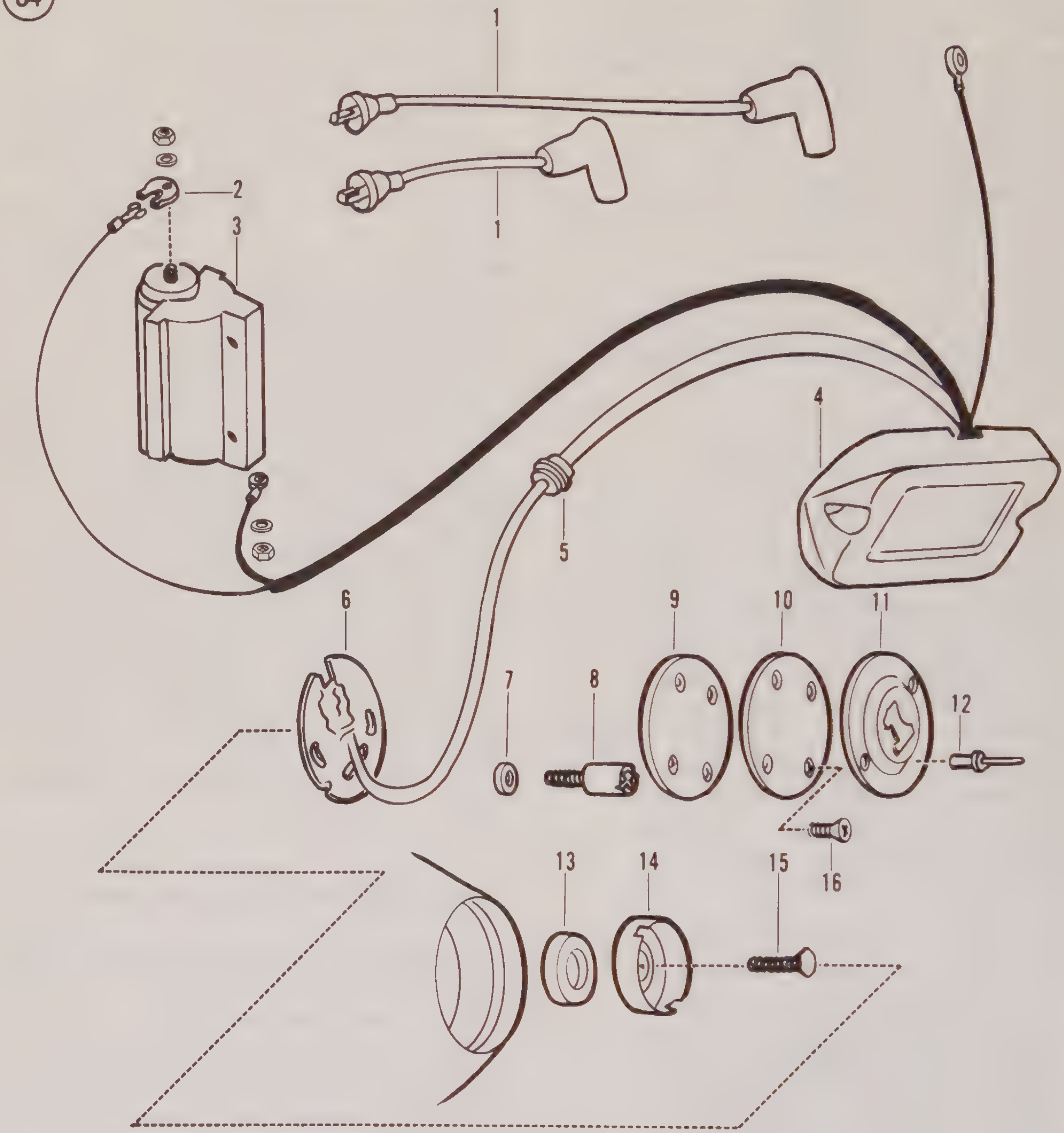
Dynamic Ignition Timing Adjustment

If periodic inspection shows that ignition timing needs to be adjusted, follow this procedure. Refer to **Figure 34**.

1. Drill out the 2 pop rivets (12) with a 3/8 in. drill bit.
2. Remove the outer cover, inner cover and gasket (9, 10, 11).
3. Loosen the timing sensor plate screws (8) just enough to allow the plate to rotate. Turn the plate as required so that the advanced mark appears during ignition timing inspection then tighten the screws.
4. Install the gasket and inner cover.
5. Install the outer cover.

NOTE

If you use pop rivets to install the outer cover, be sure you use the headless type



IGNITION (1980 AND LATER)

1. Spark plug cable (2)
2. Ignition coil terminal
3. Ignition coil
4. Ignition module
5. Connector
6. Sensor plate
7. Washer (2)
8. Sensor plate screw (2)
9. Gasket
10. Inner cover
11. Outer cover
12. Outer cover rivet (2)
13. Camshaft oil seal
14. Rotor
15. Rotor screw and star washer
16. Inner cover screw (2)

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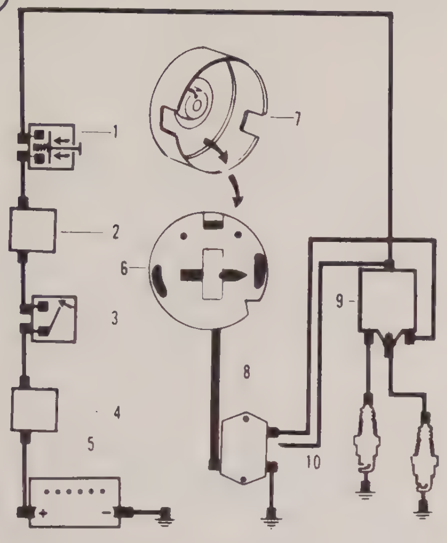

IGNITION (1980 AND LATER)

1. Engine stop switch
2. Ignition circuit breaker
3. Ignition switch
4. Main circuit breaker
5. Battery
6. Sensor plate
7. Rotor
8. Computerized control module
9. Ignition coil
10. Spark plug

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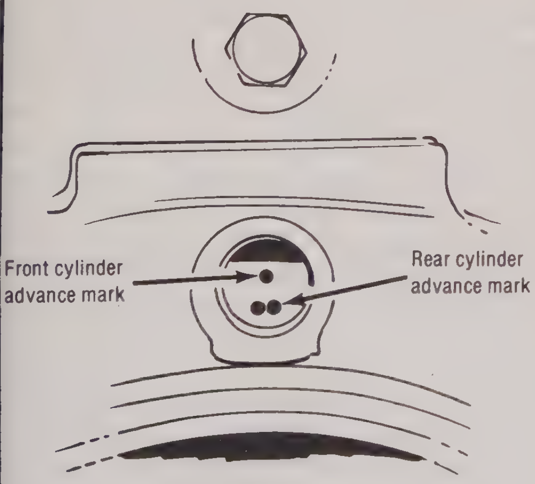

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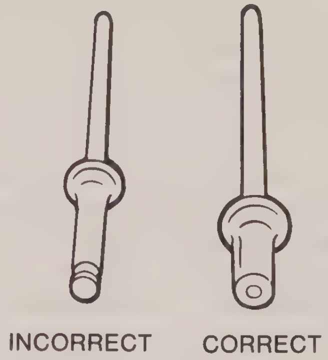

shown in ***Figure 37****. The Harley-Davidson part number for these special rivets is No. 8699. The end of a normal pop rivet will break off on installation and damage the timing mechanism. You may prefer to eliminate the outer cover and seal the rivet holes with silicone sealant or attach the outer cover with self-tapping screws. If screws are used, remove the covers and clean out any filing before you start the engine.*

Static Ignition Timing Adjustment

See **Figure 34**. When the engine has been disassembled the timing can be set roughly by hand. Position the sensor plate (6) so the screws (8) are in the middle of the plate slots. This will get the engine running for inspection with a strobe light. Always make final timing adjustment with a strobe light.

NOTE
When installing the ignition rotor (14, ***Figure 34****), apply Loctite Lock N' Seal to its bolt threads (15).*

Control Module and Sensor Test

The ignition control module itself can be checked with a voltmeter whose input resistance is 20,000 ohms/volt or higher. A lower resistance meter may give a faulty reading.

1. Disconnect the sensor plate from the control module at the connector (5, **Figure 35**).

2. Turn the ignition and the kill switch ON and measure the voltage between the No. 1 pin (red wire) and the No. 2 pin (black wire) as shown in **Figure 38**.
3. The meter should read 4.5-5.5 volts. If it does not, the control module is faulty and should be replaced.
4. To test the sensor operation, reconnect the wires and attach the spark plug lead to an extra spark plug grounded against the engine.
5. Touch a screwdriver blade to the sensor core and check for a spark at the plug as the blade touches the sensor core.
6. If there is no spark and the control module passed the previous test, the sensor is faulty and should be replaced.

Ignition Coil

The 1980 and later models use a special low-resistance ignition coil marked "E". Do not interchange early coils with "E" coils. The control module or coil could be damaged. The ignition coil can be checked for resistance with an ohmmeter. If the readings do not correspond to those given in **Table 9**, the coil should be replaced.

Spark plug cables

The spark plug cables are resistor-type with a carbon/fabric core. Use care when disconnecting the cables from the spark plugs in order to prevent core damage. Exact replacement cables must be used to enable the transistorized ignition to operate correctly.

KNOCKING, PINGING, AND DETONATION

Occasional spark knock or gas knock is normal in a high compression engine; it gives evidence that the engine is producing power close to its design capacity.

But as today's fuel "pump octane" continues to decline, some riders experience *frequent* gas knock, pinging or detonation under some conditions, even when their engines are perfectly tuned and all parts are working as designed. This is especially noticeable in emission controlled engines that have lean carburetion and are operated under heavy loads at low engine rpm (lugging). At high temperatures, even normal operation can result in detonation if the fuel octane level is insufficient.

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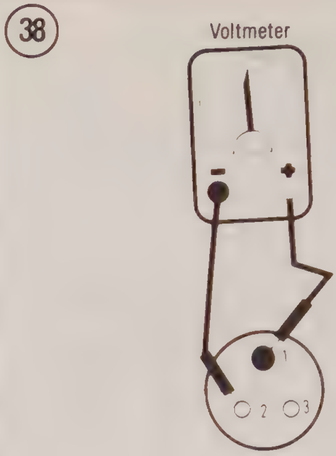

1. Red
2. Black
3. Green

CAUTION

Continued operation while the engine is knocking or pinging severely (detonating) will eventually result in engine overheating and valve and piston failure.

One way to prevent this trouble is to simply back off the throttle whenever the engine begins to knock. If this doesn't produce an acceptable result, there are several steps that may help the situation.

1. On late 1978-1979 models, make sure the mechanical ignition advance is working smoothly. If the advance mechanism sticks and does not retard fully, the advanced ignition timing will contribute to knocking.
2. One of the "unofficial" cures you might try is the practice of running a mixture of your low-octane pump gas and aviation fuel (AVGAS), which may be available to you at an airport. The higher octane of aviation fuel makes up for the low pump octane. A similar remedy is to use a commercial anti-knock fuel additive, available at most auto supply stores. Both of these options can be expensive and may be dangerous if not carefully handled.

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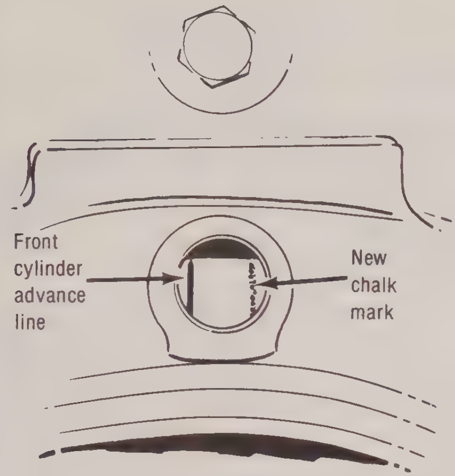

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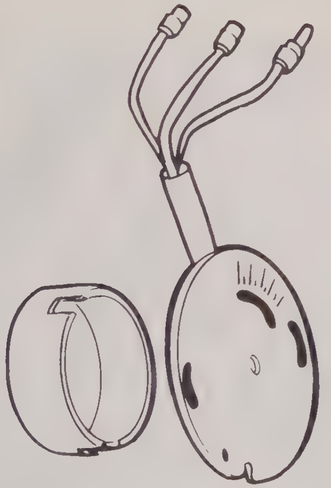

3. Ignition timing may be retarded on 1979 and later models to minimize detonation. Up to 5° retard will help. The total retard should not exceed 10° in any case or you run a risk of overheating. Again, you should expect power and fuel economy to suffer somewhat (in proportion to the amount you retard the ignition). If you take this course, retard the timing in steps of 2 1/2° (up to a maximum of 10°) and test-ride the bike after each adjustment. Change the timing as follows:
    a. On late 1978-1979 models, stop the engine and remove the ignition timing inspection plug as described under *Dynamic Ignition Timing* in this section of the supplement. Turn the engine by hand until the front cylinder advance line is at the front edge of the inspection hole. Then make a new chalk line at the rear of the inspection hole (**Figure 39**). This new line represents 10° of ignition timing retard. Inspect the dynamic ignition timing and retard it in 2 1/2° steps, as desired. If the new chalk line has moved all the way to the front of the inspection hole, ignition timing will have been retarded about 10°. Retard the timing only enough to minimize the detonation.
    b. On 1980 and later machines, the ignition timer plate has degree marks stamped on it (**Figure 40**). Each small division represents 5°. Start the machine, idle it at 2,000 rpm and use a strobe light to observe the position of the rotor slot behind the degree marks. Retard the timing in 2 1/2° steps up to a maximum of 10°, as desired. Retard the timing only enough to minimize the detonation.

TACHOMETER

In 1981 an electronic tachometer was introduced for most models. It senses engine speed through ignition pulses from the ignition coil. See the wiring diagram at the end of this book.

WIRING DIAGRAMS

Wiring diagrams for 1976 and later models are at the end of the book.

Table 9 IGNITION COIL RESISTANCE

Model Year	Primary Resistance	Secondary Resistance
1980 and later	3.3-3.7 ohms	16,500-19,500 ohms
1959-1979	4.5-5.7 ohms	16,500-20,000 ohms

Table 10 IGNITION TIMING (1980 AND LATER)

Engine Speed	Ignition Timing
0-600 rpm	3 degrees BTDC
600-1,600 rpm	21 degrees BTDC
1,600 rpm and up	35 degrees BTDC

CHAPTER SEVEN

CHASSIS

THROTTLE CONTROL

On 1976 and later models, the throttle cable upper end has a ball fitting soldered on it. The ball fitting seats in a removable cylindrical ferrule that allows the cable to be removed without cutting the cable or unsoldering the ball fitting.

On 1981 and later models, a throttle closing cable was added and the throttle grip travel stop screw was eliminated. See **Figure 41**.

Dual Throttle Cable Removal

1. See **Figure 41**. Remove the throttle clamp screws and the upper clamp.
2. Slide the cylindrical ferrules out of their throttle grip seats and remove the ferrules from their cable ball ends.
3. Disconnect the lower ends of the cables from the carburetor. Note the routing of the cables, then pull the cable and lower clamp assembly up away from the motorcycle.
4. Loosen the cable elbow locknuts at the lower grip clamp and unscrew the elbows from the clamp.

Dual Throttle Cable Installation

1. See **Figure 41**. Inspect the throttle friction spring and replace it if necessary. Make sure the friction spring is securely seated on the friction adjuster screw.

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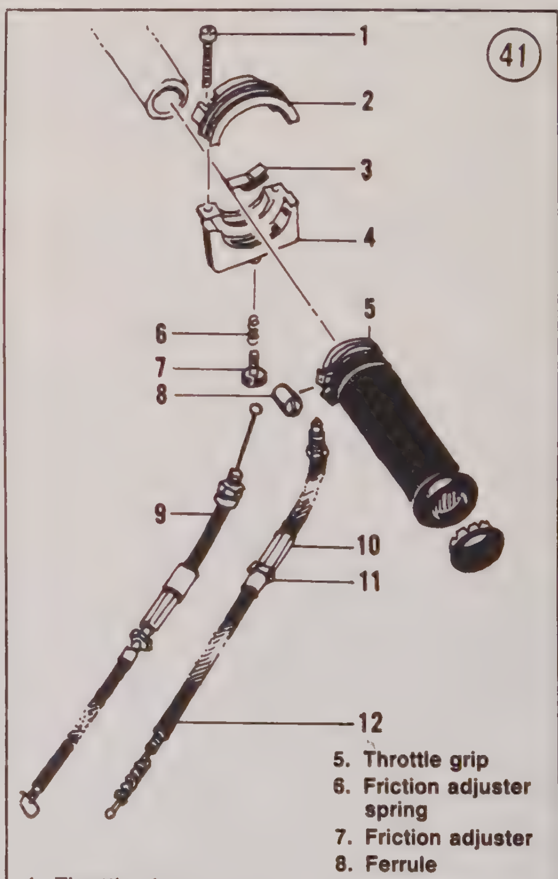
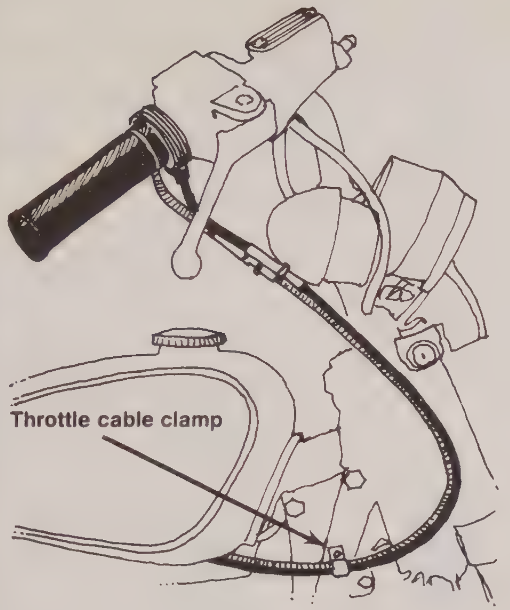


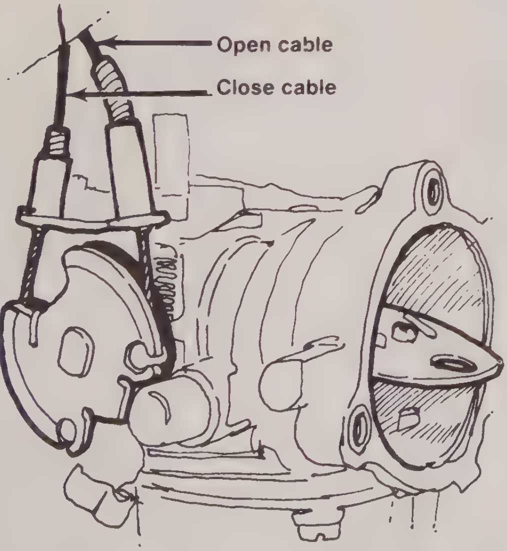
1. Throttle clamp screw
2. Upper clamp
3. Throttle friction spring
4. Lower clamp
5. Throttle grip
6. Friction adjuster spring
7. Friction adjuster
8. Ferrule
9. Open cable
10. Adjuster
11. Locknut
12. Close cable

42



2. Lubricate the insides of the grip clamps, the end of the handlebar and the cable ends and ferrules lightly with graphite grease.
3. Screw the throttle cable elbows into the lower grip clamp. The "open" cable elbow has a larger thread than the "close" cable and it goes in the left side of the lower clamp. The "close" cable has a spring at its lower end.
4. Slide the throttle grip over the handlebar, install the cylindrical ferrules on the cable ends and seat the ferrules in the grip notches.
5. Route the cables through the throttle cable clamp (**Figure 42**) and connect them to the carburetor. The open cable goes through the inside fitting and the close cable (with spring) goes through the outside fitting (**Figure 43**).
6. Install the upper grip clamp and tighten the screws securely. Turn the cable elbows so there is no stress on the cables and tighten the elbow locknuts at the lower grip clamp.
7. Adjust the cables as described in this section of the supplement.

43



Dual Throttle Cable Adjustment

Throttle cable adjustment is required to prevent damage to the throttle cables and carburetor throttle valve.

1. Loosen both cable adjuster locknuts (**Figure 41**) and shorten the adjusters all the way.
2. With the motorcycle's front wheel pointing straight ahead, open the throttle fully with the throttle grip. While the grip is fully open, lengthen the open cable adjuster until the throttle valve pulley just touches the stop boss cast into the carburetor body. If you are not sure the throttle valve is fully open, turn the pulley by hand to see if there is more movement. Tighten the open cable adjuster locknut.
3. With the motorcycle's front wheel turned all the way to the right, lengthen the close cable adjuster until the lower end of the close cable just contacts the spring in the outer cable fitting. Tighten the locknut.
4. Start the engine and rev it several times to be sure the engine returns fully to idle. Lengthen the close cable adjuster if the engine does not return to idle.

FRONT FORK

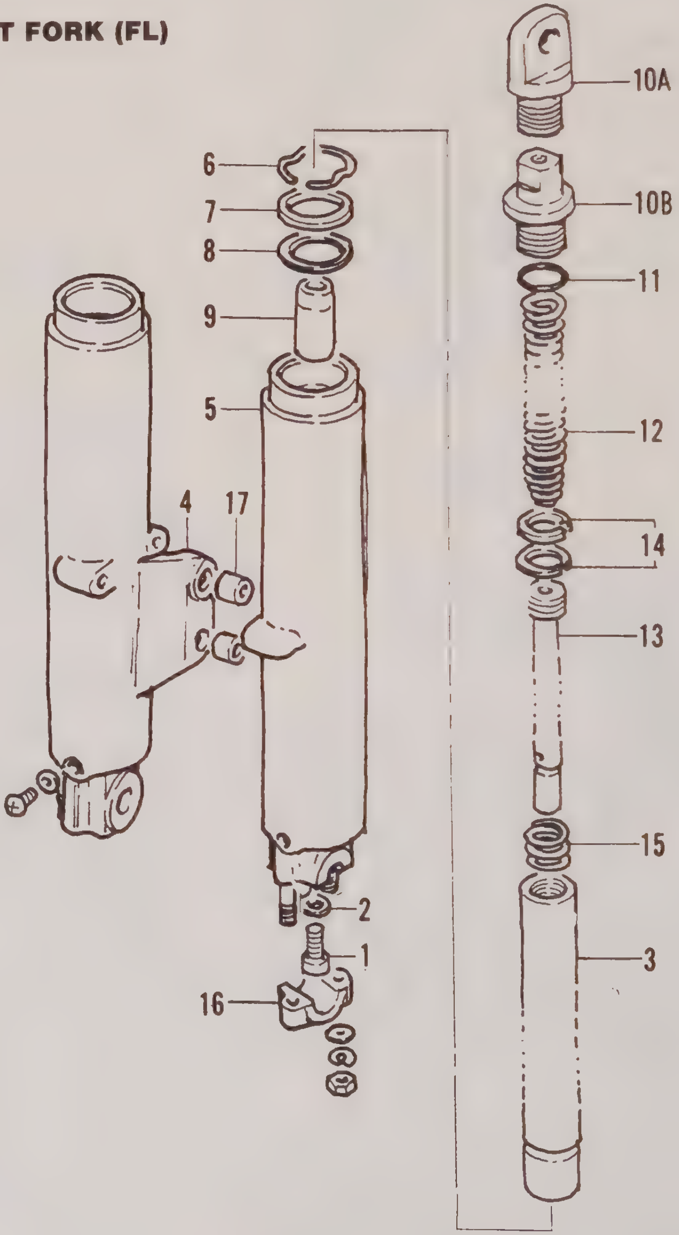
Minor modifications were made to the adjustable and non-adjustable forks in 1978. In 1980 the FXWG was introduced with the wider FL type steering brackets and FL type forks.

Service and repair procedures are essentially the same as described in the basic book. The new fork assemblies are shown in the following illustrations:

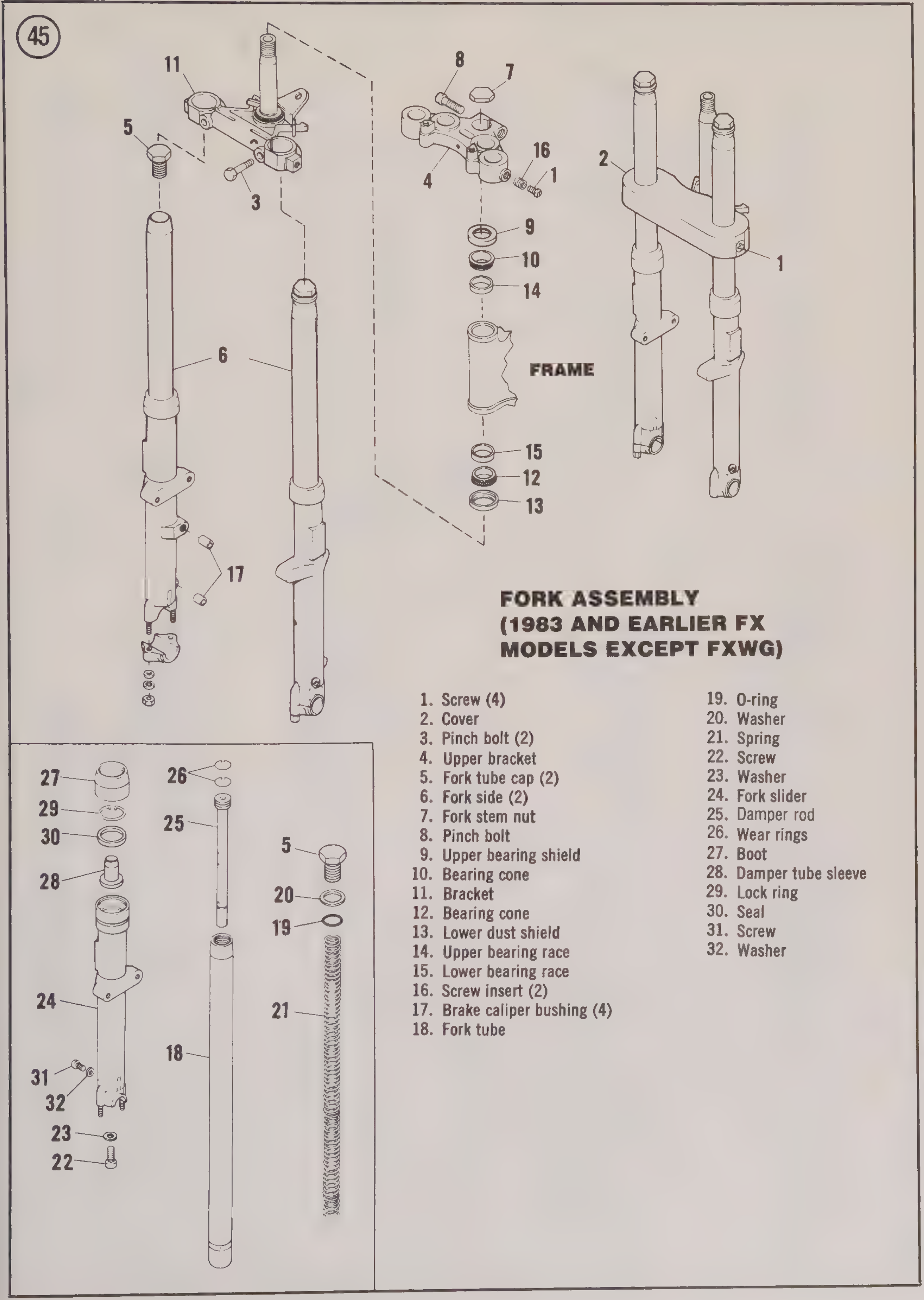
a. **Figure 44** (FL models).
b. **Figure 45** (1983 and earlier FX models except FXWG).
c. **Figure 46** (FXWG Wide-Glide).
d. **Figure 47** (1984 FX models except FXWG).
e. **Figure 48** (1984 FXWG).

(44)

FRONT FORK (FL)



1. Bolt
2. Washer
3. Fork tube
4. Right fork slider
5. Left fork slider
6. Retaining ring
7. Oil seal
8. Washer
9. Sleeve
10A. Fork cap (adjustable fork)
10B. Fork cap (non-adjustable fork)
11. O-ring
12. Spring
13. Damper rod
14. Wear rings
15. Spring
16. Cap
17. Bushing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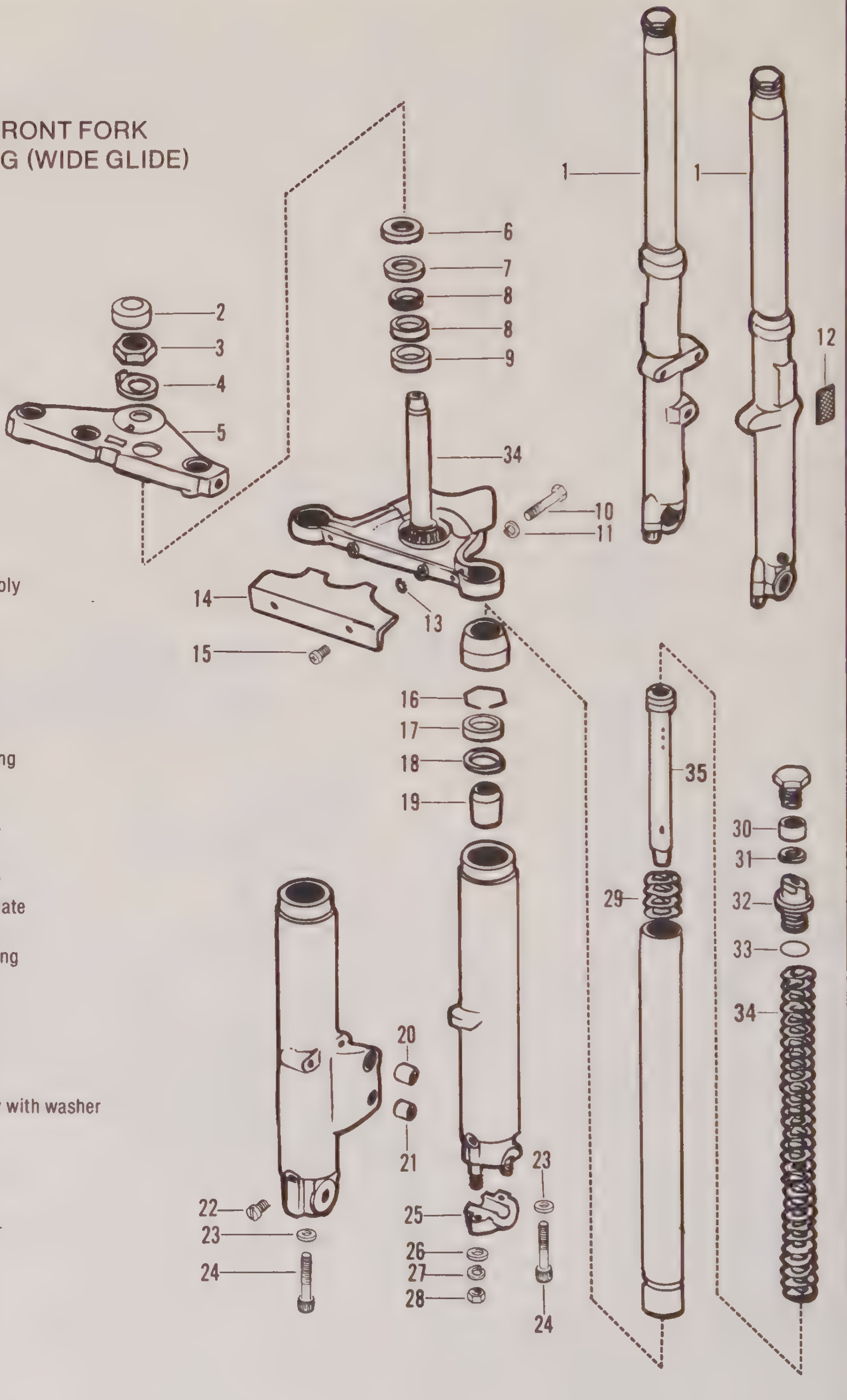
FORK ASSEMBLY (1983 AND EARLIER FX MODELS EXCEPT FXWG)

1. Screw (4)
2. Cover
3. Pinch bolt (2)
4. Upper bracket
5. Fork tube cap (2)
6. Fork side (2)
7. Fork stem nut
8. Pinch bolt
9. Upper bearing shield
10. Bearing cone
11. Bracket
12. Bearing cone
13. Lower dust shield
14. Upper bearing race
15. Lower bearing race
16. Screw insert (2)
17. Brake caliper bushing (4)
18. Fork tube
19. O-ring
20. Washer
21. Spring
22. Screw
23. Washer
24. Fork slider
25. Damper rod
26. Wear rings
27. Boot
28. Damper tube sleeve
29. Lock ring
30. Seal
31. Screw
32. Washer

46

FRONT FORK
FXWG (WIDE GLIDE)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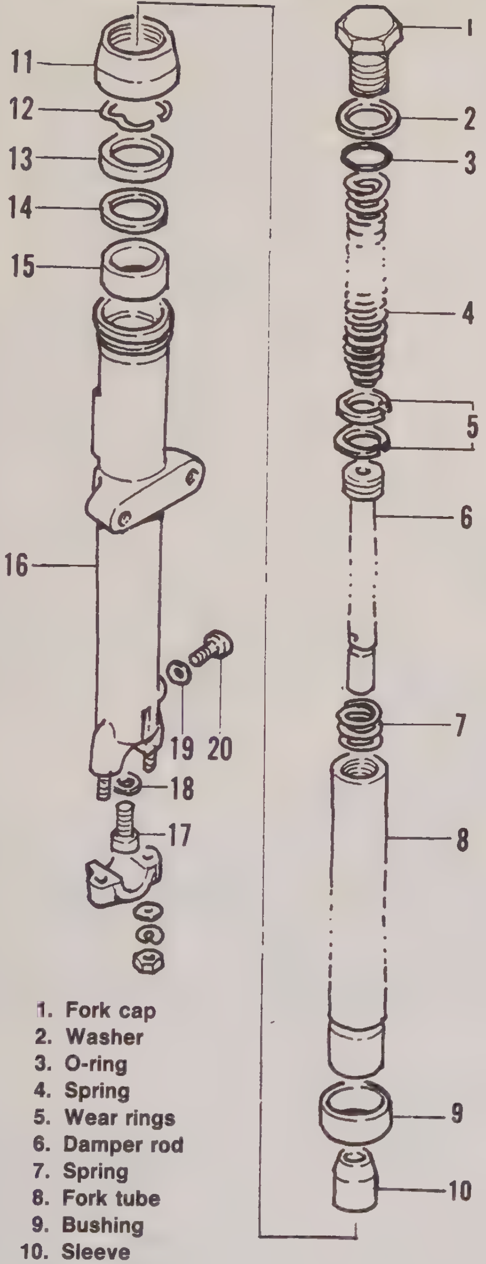
1. Fork assembly
2. Cap
3. Nut
4. Lockwasher
5. Bracket
6. Cone seat
7. Dust shield
8. Roller bearing
9. Dust shield
10. Bolt
11. Lockwasher
12. Reflector
13. Lockwasher
14. Mounting plate
15. Screw
16. Retaining ring
17. Oil seal
18. Washer
19. Lower stop
20. Bushing
21. Bushing
22. Drain screw with washer
23. Washer
24. Screw
25. Axle cap
26. Washer
27. Lockwasher
28. Nut
29. Spring
30. Spacer
31. Oil seal
32. Plug
33. O-ring
34. Spring
35. Damper rod

FRONT FORK
(1984 FX EXCEPT FXWG)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1. Fork cap
2. Washer
3. O-ring
4. Spring
5. Wear rings
6. Damper rod
7. Spring
8. Fork tube
9. Bushing
10. Sleeve
11. Dust seal
12. Retaining ring
13. Oil seal
14. Seal spacer
15. Bushing
16. Slider
17. Bolt
18. Washer
19. Washer
20. Drain screw

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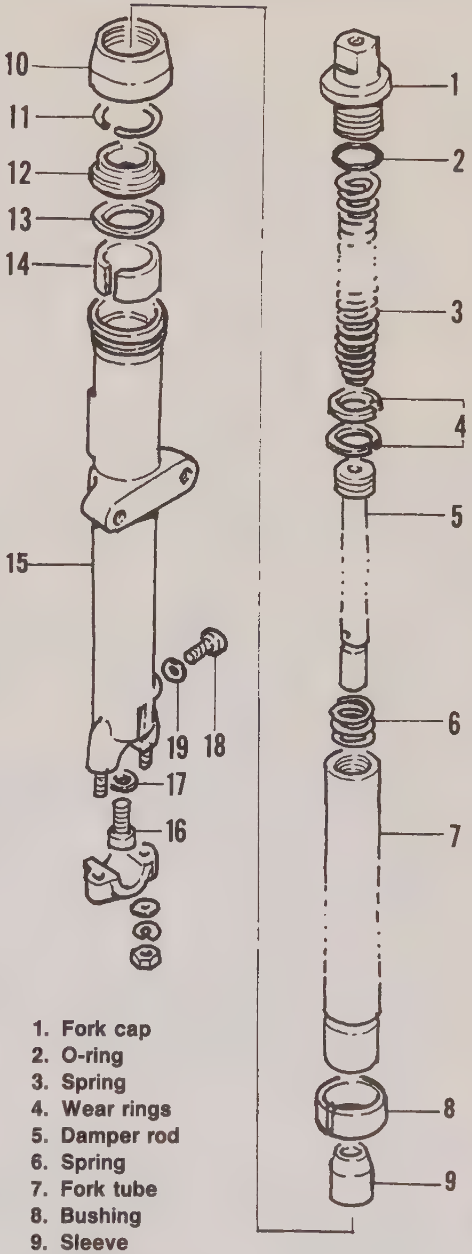
FRONT FORK (1984 FXWG)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1. Fork cap
2. O-ring
3. Spring
4. Wear rings
5. Damper rod
6. Spring
7. Fork tube
8. Bushing
9. Sleeve
10. Dust seal
11. Retaining ring
12. Oil seal
13. Seal spacer
14. Bushing
15. Slider
16. Screw
17. Washer
18. Screw
19. Washer

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Refer to **Figures 49-52** for fork stem and bracket illustrations for all models.

Fork Oil

Some fork oil capacities have changed as follows:

a. FL series (late 1977-on): wet, 7.75 oz. (230 cc); dry, 8.5 oz. (250 cc).
b. FX (except FXWG): wet, 5 oz. (148 cc); dry, 6 oz. (177 cc).
c. FXWG: wet, 9.25 oz. (275 cc); dry, 10 oz. (300 cc).

WHEELS

Front Wheel Removal/Installation

Front wheel removal and installation is similar to earlier models, with the following exceptions:

a. *All models:* New self-locking slider cap nuts should be used each time the wheel has been removed; the old ones lose their locking power.

b. *All models:* If new wheel bearings have been installed, check that bearing end play is 0.004-0.018 in. after the axle nut has been tightened. Longer or shorter bearing spacers are available to establish correct end play.

c. *1981 and later FL series:* There is a speedometer drive assembly between the hub cap and the right fork leg. Be sure the drive engages correctly with the wheel hub.

d. *1976 and later FX series (except FXWG):* The front axle is clamped to the fork sliders on both ends. When installing the wheel, insert the axle and tighten the slider cap nuts on the nut end of the axle to hold the axle, tighten the axle nut to 50 ft.-lb., then tighten the slider cap nuts on the other end of the axle.

e. *FXWG:* The FXWG has a spacer between the wheel assembly and the left fork leg; it has no speedometer drive at the wheel.

Rear Spoked Hub (1982 and Later FX Series)

When the interchangeable hub is used at the rear of the 1982 and later FX series bikes, there is no washer and lock ring outside the spacer on either side of the hub.

NOTE

Some 1978 FLH bikes were subject to a safety defect recall for incorrect caliper piston retraction. Insufficient piston retraction will cause the brake to drag and overheat. Too much retraction may keep the pads from contacting the discs and may cause brake failure. When ordering replacement parts, be sure to give your dealer all the necessary information: model year and name, frame number and front or rear caliper.

Cast Rear Wheel (1984 FXSB)

The 1984 FXSB does not use a washer or circlip outside the left-hand hub grease seal or a spacer between the sprocket and wheel hub. See **Figure 53**.

Brake Fluid (1978 and Later)

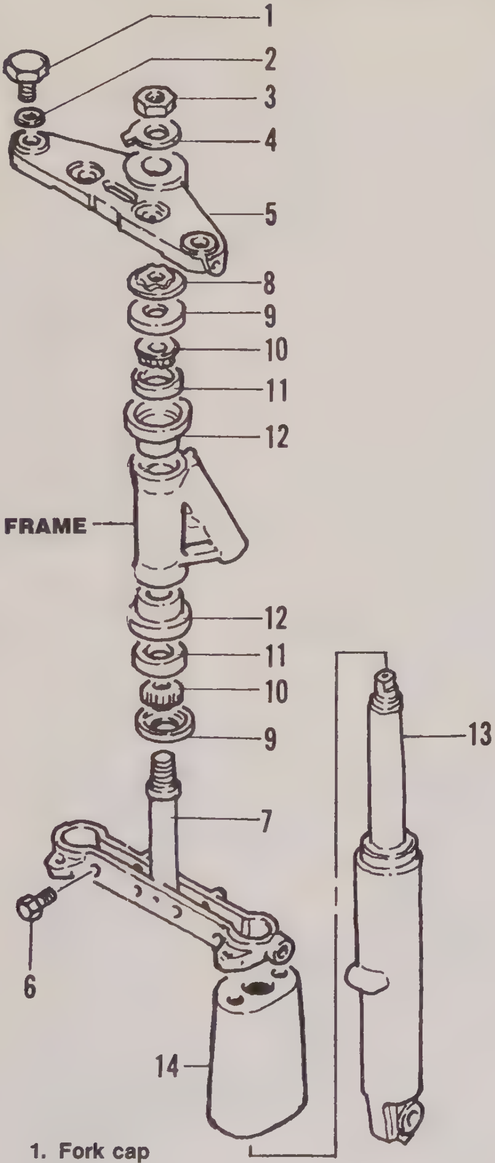
DOT 5 hydraulic disc brake fluid is specified for 1978 and later models. This silicone-based fluid does not absorb moisture like DOT 3 fluid. When installing DOT 5 fluid in machines that have other kinds of fluid, make sure all the old fluid is flushed out by DOT 5 fluid.

Brake Pads and Discs 1978 and Later)

In 1978 the brake disc material was changed to a harder stainless steel, with new pad material matched to the discs. A heat-resisting insulator was also added between the piston and the anti-rattle shim; see **Figure 54**.

The use of the new pads on older discs will result in rapid wear and scoring. When installing new pads, first sand the leading edge of the new pad with No. 60 or No. 80 grit emery cloth. After installing the pads, burnish them in with a series of rapid stops from 55 mph.

FORK BRACKET
(FL NON-ADJUSTABLE FORK)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1. Fork cap
2. Oil seal
3. Nut
4. Lockwasher
5. Upper bracket
6. Bolt
7. Fork stem and bracket
8. Bearing seat
9. Dust shield
10. Bearing
11. Bearing race
12. Steering head cup
13. Fork leg
14. Cover

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FORK BRACKET
(FL ADJUSTABLE FORK)

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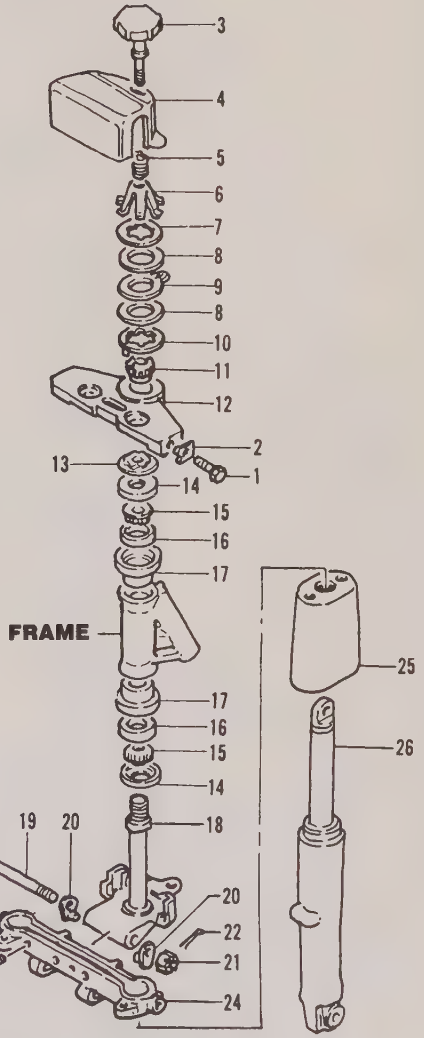
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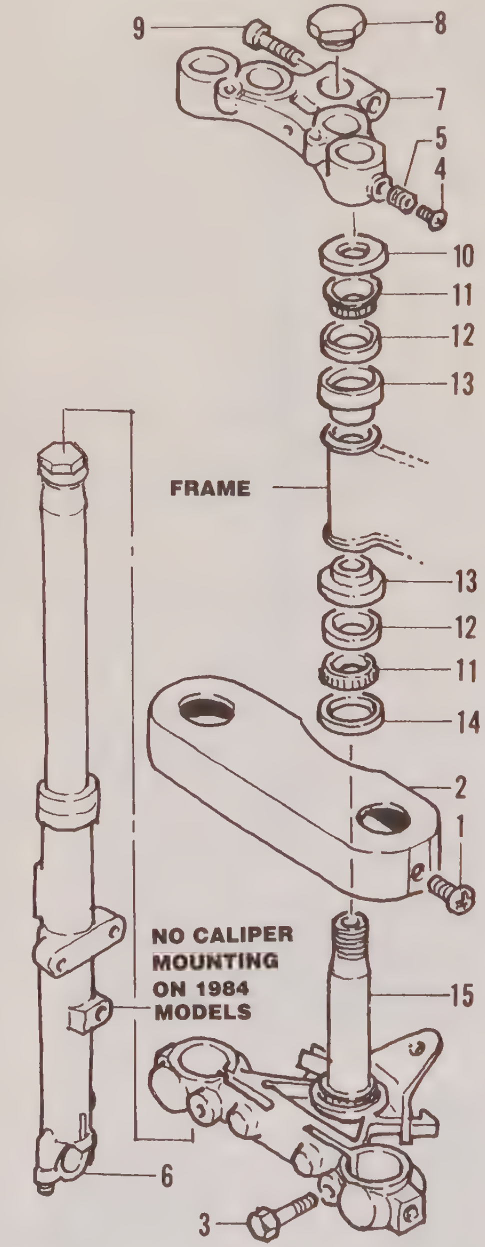
1. Bolt
2. Washer
3. Damper adjusting screw
4. Cover
5. Spring
6. Spring
7. Upper pressure disc
8. Friction washer
9. Plate
10. Lower pressure disc
11. Nut
12. Upper bracket
13. Bearing seat
14. Dust shield
15. Bearing
16. Bearing race
17. Steering head cup
18. Fork stem
19. Bolt
20. Lock plate
21. Nut
22. Cotter pin
23. Bolt
24. Lower bracket
25. Cover
26. Fork leg

(51) **FORK BRACKET (1984 FX EXCEPT FXWG)**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NO CALIPER MOUNTING ON 1984 MODELS
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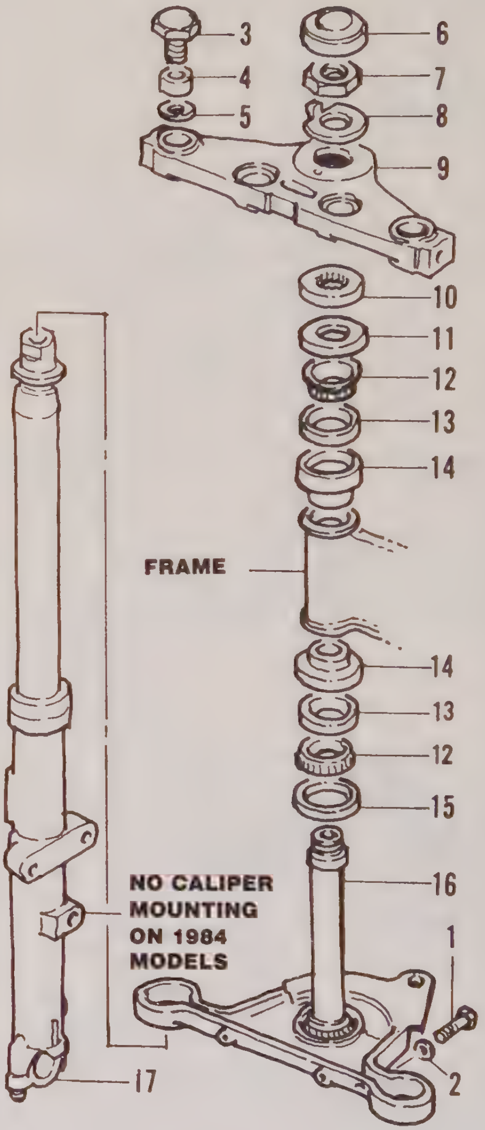
1. Screw
2. Cover
3. Bolt
4. Screw
5. Screw insert
6. Fork leg
7. Upper bracket
8. Nut
9. Bolt
10. Dust cover
11. Bearing
12. Bearing race
13. Steering head cup
14. Dust cover
15. Fork stem and bracket

(52) **FORK BRACKET (1984 FXWG)**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NO CALIPER MOUNTING ON 1984 MODELS
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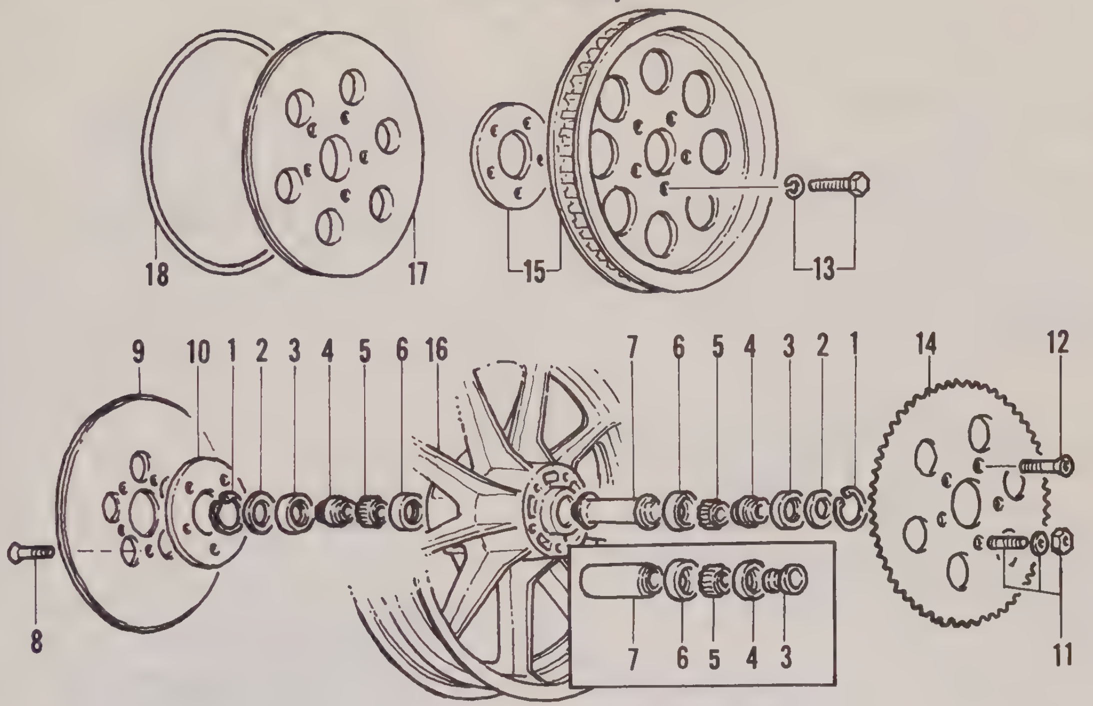
1. Bolt
2. Lockwasher
3. Fork cap
4. Washer
5. Oil seal
6. Cap
7. Nut
8. Lockwasher
9. Upper bracket
10. Bearing seat
11. Dust cover
12. Bearing
13. Bearing race
14. Steering head cup
15. Lower dust shield
16. Fork stem and bracket
17. Fork leg

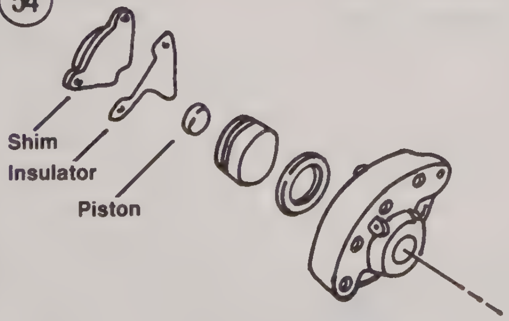
(53)

CAST REAR WHEEL
(ALL MODELS)



1. Retaining ring (1983 and earlier)
2. Washer (1983 and earlier)
3. Spacer
4. Oil seal
5. Bearing
6. Bearing race
7. Spacer
8. Screw
9. Brake disc
10. Spacer
11. Sprocket mounting hardware (FL models)
12. Sprocket mounting hardware (FX models)
13. Sprocket mounting hardware (belt drive)
14. Sprocket (chain drive)
15. Sprocket and spacer (belt drive)
16. Rear wheel
17. Brake disc (1982-on FLH)
18. Brake disc spring (1982-on FLH)

(54)



Rear Brake Adjustment (FL Series—Late 1979 and Later)

Instead of moving the rear master cylinder to adjust the brake, the rear brake is adjusted by loosening a locknut and turning a stop bolt (**Figure 55**). Adjust the bolt for 1/16 in. master cylinder plunger free play before the plunger contacts the master cylinder piston. Tighten the locknut.

Rear Brake Adjustment (FXWG)

The Wide Glide rear brake adjuster bolt is to the rear of the brake pedal pivot (**Figure**

56). Loosen the locknut and adjust the bolt for 1/16 in. master cylinder plunger free play before the plunger contacts the master cylinder piston. Tighten the locknut.

Rear Brake Adjustment (1984 FXWG)

Referring to **Figure 57**, loosen the brake pedal locknut and turn the stop bolt to obtain a suitable brake pedal height. Then loosen the plunger locknut and turn the plunger forward to increase free play or rearward to obtain suitable free play.

FRONT CALIPER (FL SERIES—LATE 1980 AND LATER); REAR CALIPER (FL/FX SERIES—LATE 1980)

Figure 58 is an exploded drawing of the front brake caliper on late 1980 and later FL series bikes. The late 1980 FL and FX rear caliper is similar, except for the mounting hardware described in the basic book. Service and repair is essentially the same as described in the basic book. Note the following:

a. There is an insulator (7) between the piston (8) and the shim (4).
b. There is a new caliper piston and seal. In addition to sealing the brake fluid, the square cross-section "quad" seal also retracts the piston when the brake is released. This seal replaces the spring retractors and O-ring used on previous calipers. When you install the piston and seal inside the caliper, make sure the seal doesn't roll out of the piston groove.
c. Piston retraction is not specified for these brakes. When ordering replacement parts, be sure to give your dealer all the necessary information: model year and designation, frame number, and front or rear caliper. The front and rear calipers are not interchangeable due to differing seal retraction rates.

WARNING
Do not ride the motorcycle until you are sure the brakes are working properly.

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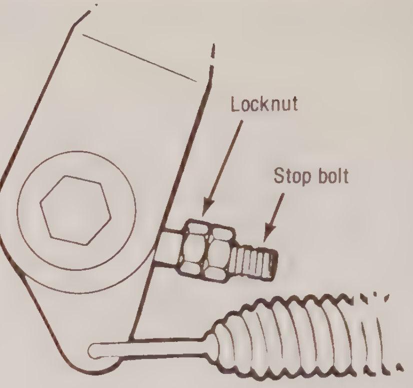

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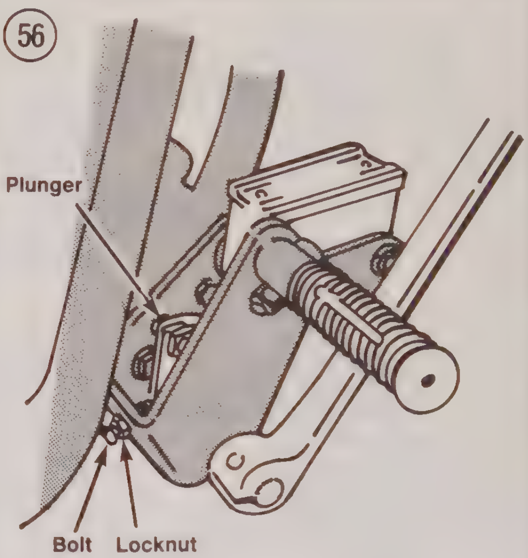
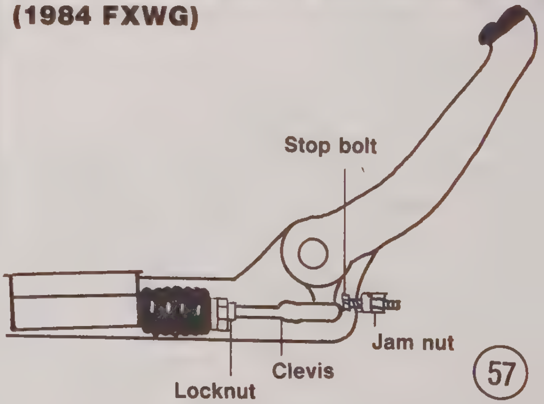


REAR BRAKE PEDAL ADJUSTMENT (1984 FXWG)



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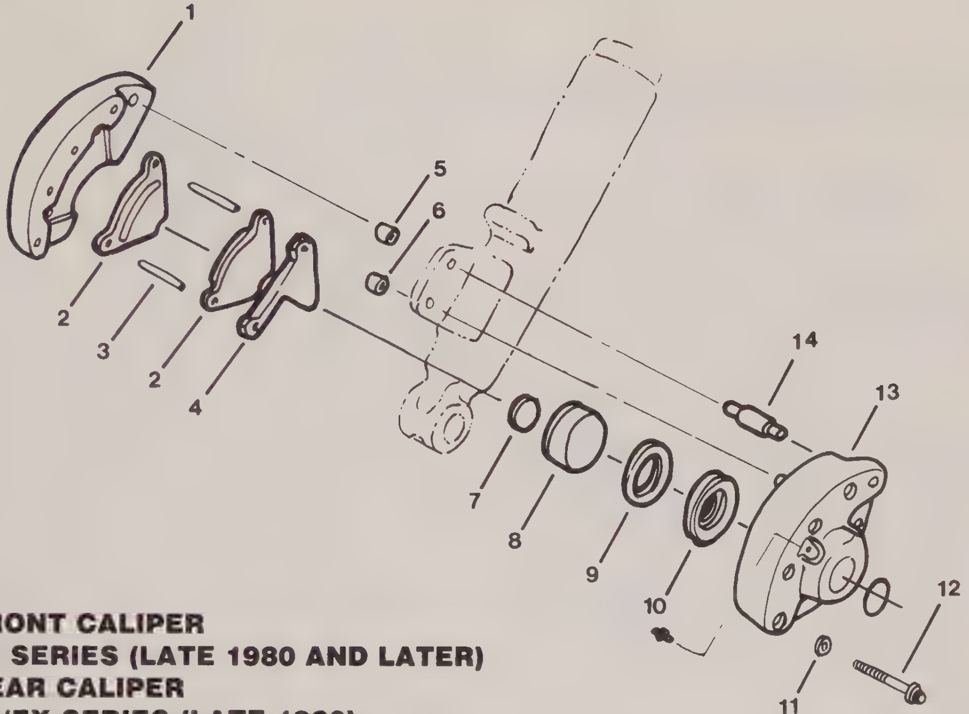
(58)



FRONT CALIPER
FL SERIES (LATE 1980 AND LATER)
REAR CALIPER
FL/FX SERIES (LATE 1980)

1. Inner caliper half
2. Brake pad (2)
3. Pin (2)
4. Shim
5. Bushing, long
6. Bushing, short
7. Insulator
8. Piston
9. Seal
10. Dust cover
11. Washer (4)
12. Caliper bolt (4)
13. Outer caliper half
14. Mounting pin

FRONT CALIPER
FX SERIES

(1979-1983)

The front brake caliper for 1977-1983 FX models is shown in **Figure 59**.

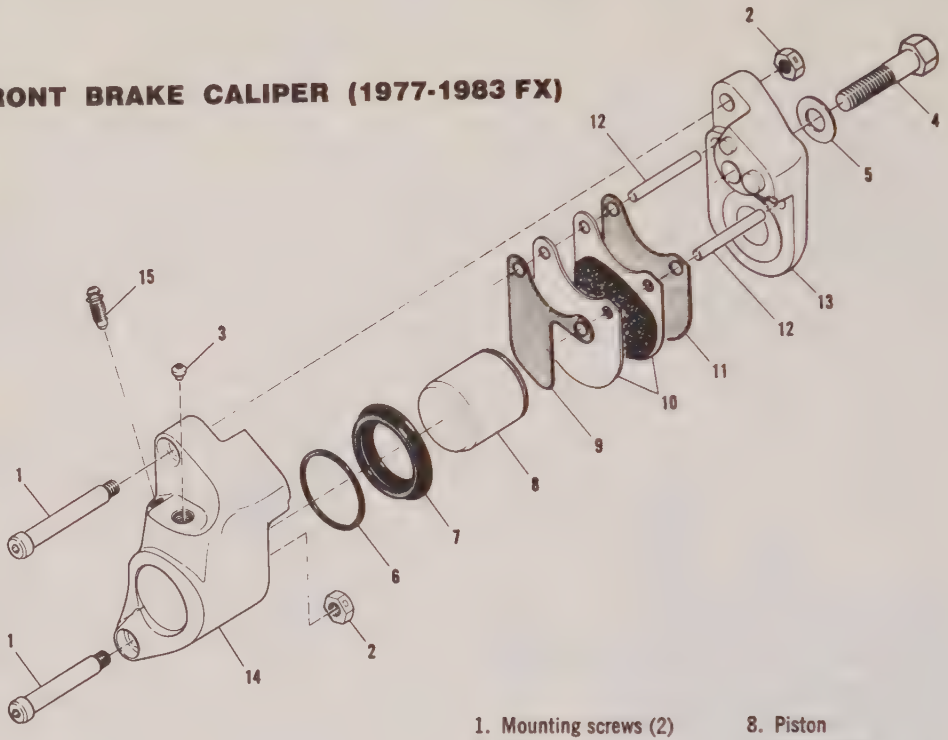
NOTE
Harley-Davidson offers a foam tape to help prevent caliper rattle on 1982 models. Apply the tape as shown in ***Figure 60.***

Disassembly/Assembly

1. See **Figure 59**. Remove the 2 nuts and bolts that mount the caliper. Slide the caliper off the disc.
2. Pump the piston out of the caliper with the brake lever. Add fluid to the master cylinder if necessary as the piston pumps out.
3. Turn the handlebar so the master cylinder is as close to level as possible.
4. Remove the fluid reservoir cover and gasket. Disconnect the brake line at the caliper and drain the fluid into a container. Throw away the fluid–do not reuse it.
5. Turn the outer caliper half upside down and shake out the brake hose seat.
6. Remove the large bolt from the center of the caliper and separate the 2 halves.
7. Remove the alignment pins, plates and pads.

59

FRONT BRAKE CALIPER (1977-1983 FX)



1. Mounting screws (2)
2. Nut (2)
3. Brake hose seat
4. Bolt
5. Washer
6. Seal
7. Piston boot
8. Piston
9. Outer plate
10. Brake pad set
11. Inner plate
12. Pins
13. Inner caliper
14. Outer caliper
15. Bleed fitting

8. Remove the piston, piston boot and O-ring from the piston bore. Be careful not to scratch the bore.

9. Clean all parts in fresh brake fluid. Do not use gasoline or petroleum solvents.

10. Measure the brake pads. If the friction material is worn thinner than 1/16 in., install new pads all around.

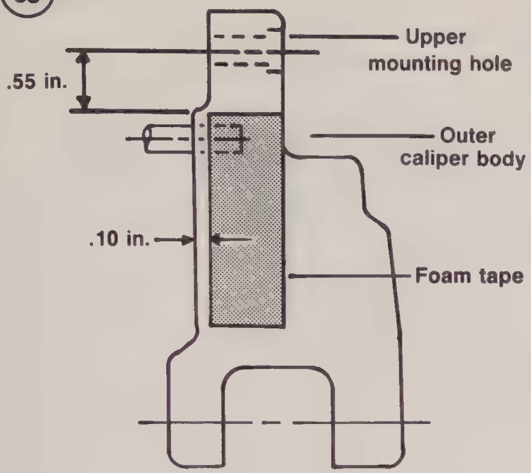
11. Inspect the caliper bore and piston for wear or scoring. Replace them as a set if any wear or damage is evident.

NOTE

The 1978 FX, FXS and FXE were subject to a safety defect recall for a possible faulty washer under the large bolt that clamps the 2 caliper halves together (item 5, ***Figure 59****). Inspect the washer closely for cracks. Contact a Harley-Davidson dealer if you suspect the washer is faulty.*

12. To assemble, reverse the disassembly steps. Note the following:
   a. Make sure all parts are clean, dry and oil-free.
   b. Install new rubber parts. Coat all rubber parts with fresh brake fluid before assembling.
   c. Push the piston all the way into its bore.
   d. Torque the large bolt holding the caliper halves together to 50 ft.-lb.
   e. Use Loctite Lock N' Seal on the caliper mounting nuts.
   f. Bleed the hydraulic system after installing the caliper. See *Bleeding*

60


Upper
mounting hole
.55 in.
Outer
caliper body
.10 in.
Foam tape

Hydraulic System in Chapter Seven of the basic book.

WARNING
Do not ride the motorcycle until you are sure the brakes are working properly.

FRONT CALIPER (FX SERIES—1984)

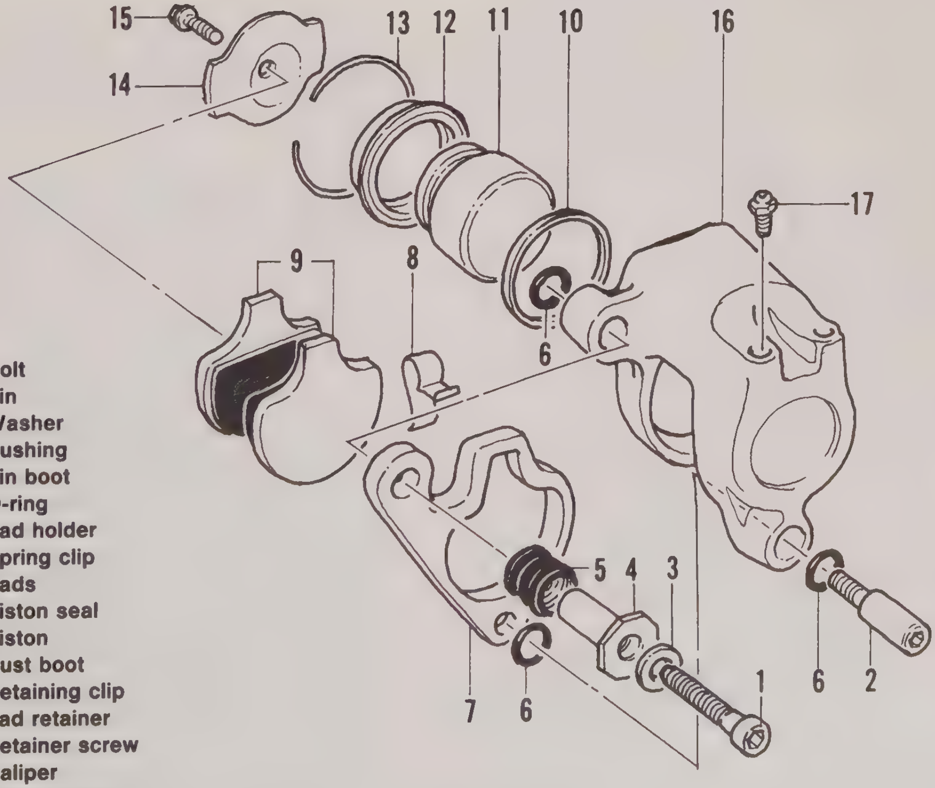
The front brake caliper for 1984 FX models is shown in **Figure 61**.

Disassembly/Assembly

1. Remove the caliper upper mounting Allen bolt and the lower mounting pin bolt and remove the caliper assembly.

61

FRONT BRAKE CALIPER (1984 FX)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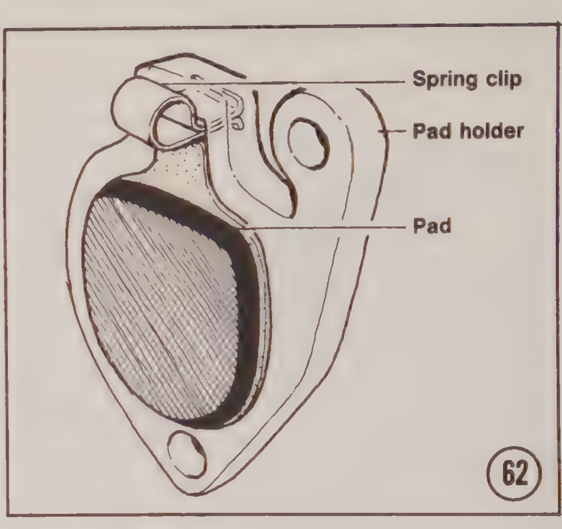
1. Bolt
2. Pin
3. Washer
4. Bushing
5. Pin boot
6. O-ring
7. Pad holder
8. Spring clip
9. Pads
10. Piston seal
11. Piston
12. Dust boot
13. Retaining clip
14. Pad retainer
15. Retainer screw
16. Caliper
17. Bleed screw

2. Disconnect the brake line at the caliper.
3. Referring to **Figure 61**, remove the retainer screw, pad retainer and inside pad.
4. Slide the pad holder out of the caliper housing. Then remove the outer brake pad by pushing the pad free of the hold-down spring clip.
5. Insert a small screwdriver into the notched groove in the lower piston bore and pry out the retaining clip.
6. Remove the piston dust boot.
7. Place several layers of cloth or a block of soft wood over the caliper piston. Blow compressed air into the brake hose fitting to force the caliper piston out of its bore. Service station air hoses will work well if you do not have an air compressor.

WARNING

The caliper piston may come out of its bore with considerable force. Point the piston away from your body to prevent injury.

8. Pull the threaded bushing out of the pad holder. Then remove the pin boot.
9. Referring to **Figure 61**, remove the O-rings from the caliper by carefully prying them out of the caliper. Be careful not to scratch the bore. Remove the O-ring from the piston.
10. Clean all parts (except brake pads) in fresh brake fluid. Do not use gasoline or petroleum solvents.
11. Measure the brake pads. If the friction material is worn thinner than 1/16 in., install new pads all around.
12. Inspect the caliper bore and piston for wear or scoring. Replace them as a set if any wear or damage is evident.
13. Make sure all parts are clean, dry and oil-free.
14. Install new rubber parts. Coat all rubber parts with fresh brake fluid (DOT 5) before assembly.
15. Install the 3 caliper O-rings in the caliper. Install the piston O-ring.
16. Install the dust boot on the piston so that the open side faces downward. Push the boot downward until the inner boot lip seats in the top piston groove.
17. Coat the piston with DOT 5 brake fluid. Then install the piston assembly into the cylinder. If necessary, press the piston in with a C-clamp.



NOTE

To ease installation when fitting the caliper over the brake disc, the piston must be pressed all the way into the caliper bore.

18. With the retainer wire gap positioned at the top of the caliper, compress the retainer wire and install it into the piston bore. Make sure the retainer wire seats against the piston dust boot.
19. Install the threaded bushing by pushing it into the pin boot and through the bushing bore into the mounting lug. The pin boot is installed correctly when the free end of the boot seats in the grooved shoulder next to the threaded bushing.
20. Referring to **Figure 62**, install the spring clip at the top of the pad holder.
21. Place the brake pad (with the insulator backing) on top of the spring clip (**Figure 62**) so that the lower end of the pad enters the opening in the pad holder. Then push down on the pad so it is firmly held in position by the spring clip. See **Figure 62**.
22. Insert the outer pad and pad holder with spring clip into the caliper housing so the backside of the pad is next to the caliper piston.

NOTE

The spring clip loop and the pad friction material must be installed so *that they face away from the caliper piston.*

23. Coat the mounting pin with Dow Corning Moly 44 grease.
24. Position the caliper over the brake disc.
25. Install the brake caliper bolts. Tighten the lower mounting bolt, then the upper mounting bolt. Tighten both bolts to 40-45 ft.-lb.
26. Connect the brake line at the caliper. Tighten the banjo bolt to 30-35 ft.-lb.
27. Fill the master cylinder with new DOT 5 hydraulic brake fluid. Bleed the brake system as described under *Bleeding Hydraulic System* in Chapter Seven of the basic book.

NOTE
When actuating the brake lever in Step 27, a small spurt of fluid should break through the fluid surface in the master cylinder to indicate that all internal master cylinder components are working properly.

28. Install the master cylinder gasket and cover after bleeding the brakes.

WARNING
Do not ride the motorcycle until you are sure the brakes are working properly.

REAR CALIPER (DUAL-PISTON— 1981 AND LATER)

The dual-piston rear brake caliper used on some 1981 and later models is shown in **Figure 63**.

Disassembly/Assembly

1. See **Figure 63**. Remove the 2 bolts (1) and washers that mount the caliper to the bracket. Remove the pins into which the bolts thread (3) and the spring washers and seals (5).
2. Lift the caliper, plates and pads off the disc.
3. Pump the pistons out of the caliper with the brake pedal. Add fluid to the master cylinder, if necessary, as the pistons pump out.
4. Disconnect the brake line at the caliper and drain the fluid into a container. Throw away the fluid; do not reuse it.
5. Turn the outer caliper upside down and shake out the brake hose seat.
6. Remove the pistons, piston boots and seals from the piston bores. Be careful not to scratch the bores.
7. Clean all parts in fresh brake fluid. Do not use gasoline or petroleum solvents.
8. Measure the brake pads. If the friction material is worn thinner than 1/16 in., install new pads all around.
9. Inspect the caliper bores and pistons for wear or scoring. Replace them as a set if any wear or damage is evident.
10. Replace any worn or damaged parts.
11. To assemble, reverse the disassembly steps. Note the following:
    a. Make sure all parts are clean, dry and oil-free.
    b. Install new rubber parts. Coat all rubber parts with fresh brake fluid before assembling.
    c. Push the pistons all the way into their bores. Make sure the seals don't roll out of the piston grooves.
    d. Slide the caliper down over the brake disc, with the disc between the brake pads.
    e. Install the seals (5) and coat the pins (3) with anti-seize compound, such as Harley-Davidson Anti-Seize.
    f. Torque the bolts to 13.5 ft.-lb.
    g. Bleed the hydraulic system after installing the caliper. See *Bleeding Hydraulic System* in Chapter Seven of the basic book.

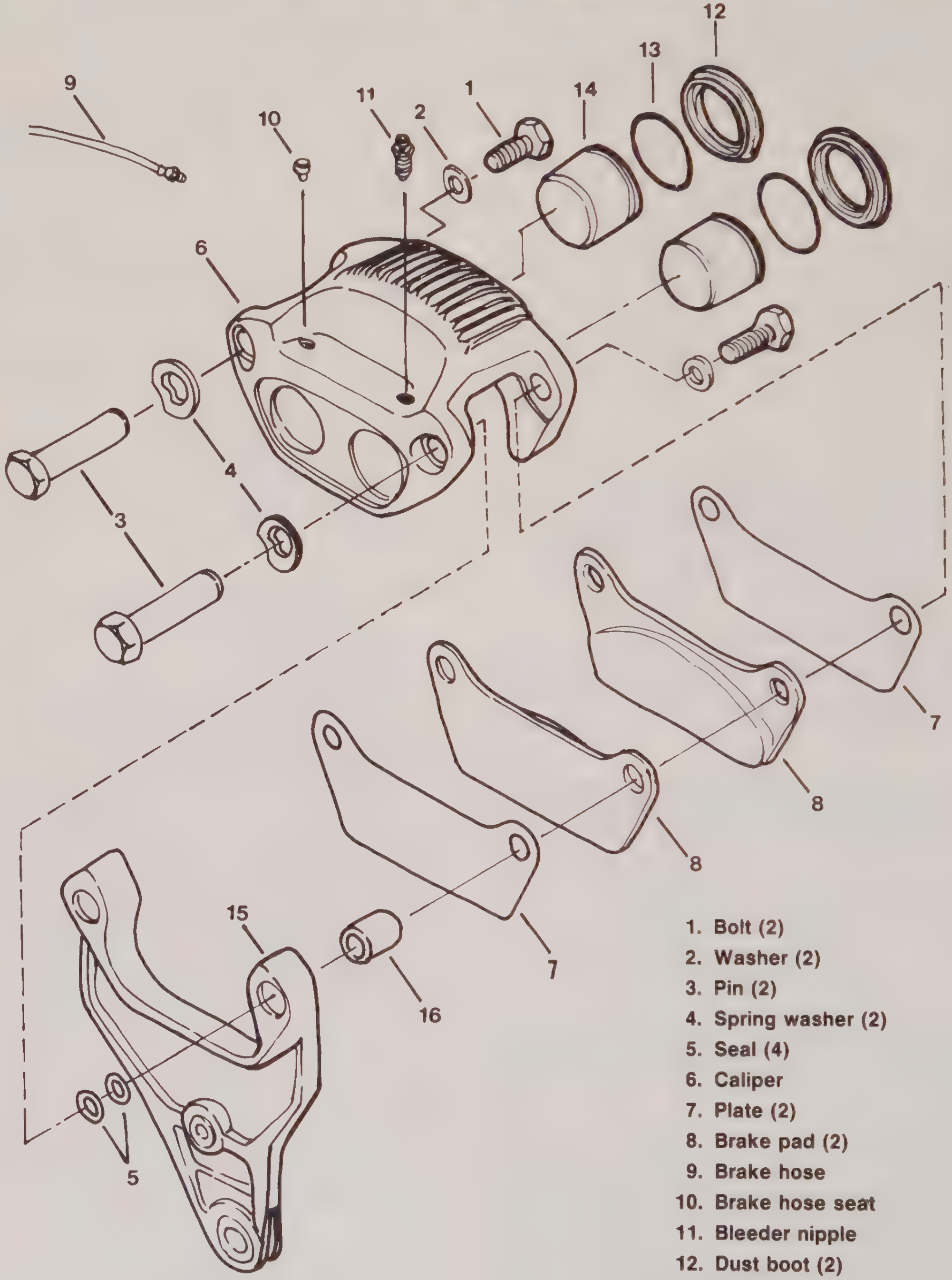
WARNING
Do not ride the motorcycle until you are sure the brakes are working properly.

REAR BRAKE DISC (FLH 1981 AND LATER)

On 1981 and later FLH models, a grooved rear brake disc is used, with a spring stretched around the circumference of the groove.

63

TWIN PISTON REAR CALIPER (1981-ON FL AND FLH MODELS)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1. Bolt (2)
2. Washer (2)
3. Pin (2)
4. Spring washer (2)
5. Seal (4)
6. Caliper
7. Plate (2)
8. Brake pad (2)
9. Brake hose
10. Brake hose seat
11. Bleeder nipple
12. Dust boot (2)
13. Square seal (2)
14. Piston (2)
15. Mounting bracket
16. Bushing (2)

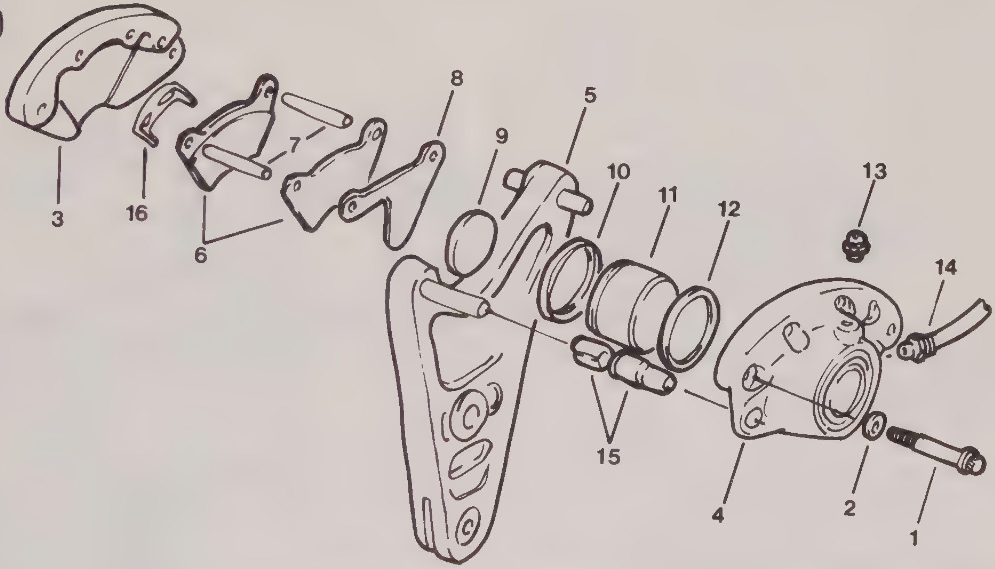
REAR CALIPER (SINGLE-PISTON– 1981 AND LATER)

The single-piston rear brake caliper used on some 1981 and later models is shown in **Figure 64**.

Disassembly/Assembly

1. See **Figure 64.** Remove the 2 screws (1) and washers that hold the caliper halves together. Remove the caliper halves from the bracket. Remove the damper and sleeve (15).
2. Remove the pins, brake pads, plate, anti-rattle spring and the insulator.
3. Pump the piston out of the caliper with the brake pedal. Add fluid to the master cylinder if necessary as the piston pumps out.
4. Remove the piston, piston boot and seal from the piston bore. Be careful not to scratch the bore.
5. Disconnect the brake line at the caliper and drain the fluid into a container. Throw away the fluid–do not reuse it.
6. Turn the outer caliper half upside down and shake out the brake hose seat.
7. Clean all parts in fresh brake fluid. Do not use gasoline or petroleum solvents.
8. Measure the brake pads. If the friction material is worn thinner than 1/16 in., install new pads all around.
9. Inspect the caliper bore and piston for wear or scoring. Replace them as a set if any wear or damage is evident.
10. Replace any worn or damaged parts.
11. To assemble, reverse the disassembly steps. Note the following:

64



SINGLE PISTON REAR CALIPER
(1981-1982 FX
AND EARLY 1983 FXE)

1. Bolt (4)
2. Washer (4)
3. Inner caliper
4. Outer caliper
5. Mounting bracket
6. Brake pad (2)
7. Brake pad pin (2)
8. Plate
9. Insulator
10. Dust boot
11. Piston
12. Square seal
13. Bleeder nipple
14. Brake hose
15. Damper and sleeve
16. Anti-rattle spring

a. Make sure all parts are clean, dry and oil-free.

b. Install new rubber parts. Coat all rubber parts with fresh brake fluid before assembling.

c. Push the piston all the way into its bore. Make sure the seal doesn't roll out of the piston groove.

d. Install the anti-rattle spring (16) with its arc to the top and the prongs to the right side of the caliper.

e. Coat the mounting screws (1) with anti-seize compound such as Harley-Davidson Anti-Seize and torque them to 35 ft.-lb.

f. Bleed the hydraulic system after installing the caliper. See *Bleeding Front Brake* in Chapter Seven of the basic book.

WARNING

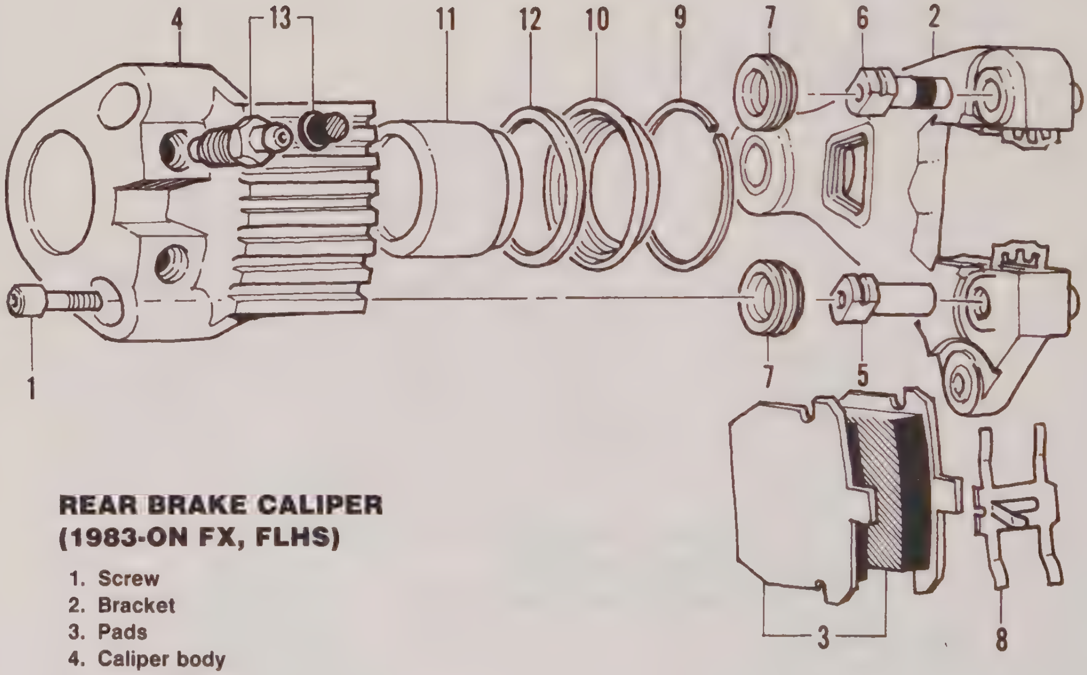
Do not ride the motorcycle until you are sure the brakes are working properly.

REAR CALIPER (SINGLE-PISTON 1983-ON FX AND FLHS)

Disassembly/Assembly

1. See **Figure 65**. Remove the screws securing the caliper body to the bracket. Lift the caliper body off the bracket.

65



REAR BRAKE CALIPER (1983-ON FX, FLHS)

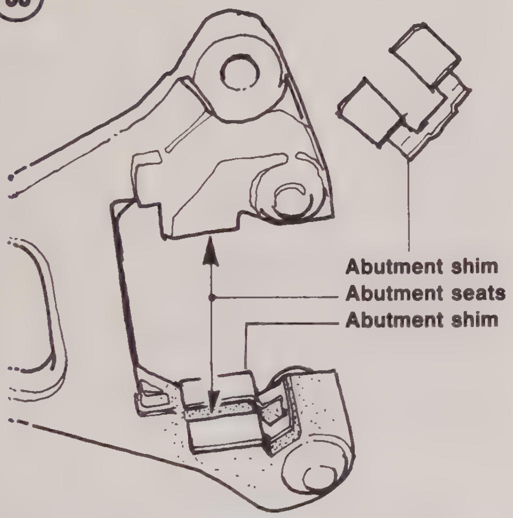
1. Screw
2. Bracket
3. Pads
4. Caliper body
5. Lower pin
6. Upper pin
7. Pin boot
8. Pad spring
9. Retaining ring
10. Piston boot
11. Piston
12. Seal
13. Bleed screw

2. Remove the brake pads from the caliper body.
3. Remove the pins and boots from the bracket.
4. Remove the pad spring from the caliper body.
5. Pry the retaining wire out of the caliper body and remove the piston boot.
6. Remove the piston as follows:
   a. Pump the brake lever until the piston reaches its full travel in the caliper bore.
   b. Place several layers of cloth or a block of soft wood over the caliper piston. Then blow compressed air into the brake hose fitting to force the caliper piston out of its bore. Service station air hoses will work well if you do not have an air compressor.

WARNING
The caliper piston may come out of its bore with considerable force. Point the piston away from your body to prevent injury.

7. Clean all parts (except brake pads) in fresh brake fluid. Do not use gasoline or petroleum solvents.
8. Measure the brake pads. If the friction material is worn thinner than 1/16 in., install new pads all around.
9. Inspect the caliper bore and piston for wear or scoring. Replace them as a set if any wear or damage is evident.
10. Inspect the abutment shims on the bracket (**Figure 66**). If shims are lost or damaged, replace them as follows:
   a. Pry the abutment shims off the bracket.
   b. Remove all existing adhesive from the bracket by scraping with a knife. Then sand the surface lightly with fine emery cloth.
   c. Clean the bracket surface with denatured alcohol after removing all adhesive material.
   d. Apply silicone sealant to the bracket surface and install the abutment shim. Install the brake pads in the bracket to hold the shims in position until the sealant dries.
   e. After sealant dries, check that the brake pads have free lateral movement in the bracket.
11. Make sure all parts are clean, dry and oil-free.
12. Install new rubber parts. Coat all rubber parts with fresh brake fluid (DOT 5) before assembling.
13. Install a new seal into the caliper bore.
14. Install the following parts in order:
   a. Piston.
   b. Boot.
   c. Retaining wire.
15. See **Figure 67**. Install the pad spring in the caliper so that the long tab extends above

66



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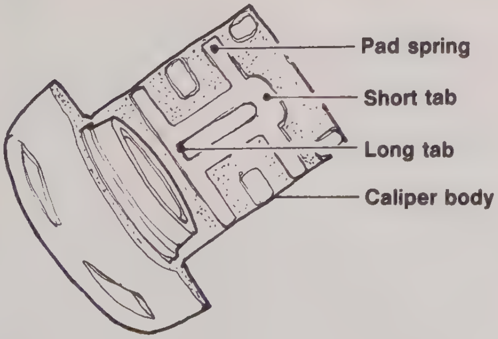


piston. Then press the spring in the caliper casting so that the spring's short tab is positioned below the piston.

16. Coat pins and the bracket assembly pin bores with silicone grease.
17. Install pin boots on pins and insert pins into pin bores.

NOTE
Pin with nylon sleeve should be installed into top pin bore.

18. Turn pins so that flats are parallel with opening in bracket assembly.
19. Install brake pads on bracket. Then place caliper body onto the bracket, making sure the pins do not turn.
20. Install caliper body screws and tighten to 12-15 ft.-lb. Pins should be positioned so that pin flats are parallel with opening in bracket.
21. Fill the master cylinder with new DOT 5 hydraulic brake fluid. Bleed the brake system as described under *Bleeding Hydraulic System* in Chapter Seven of the basic book.

WARNING
Do not ride the motorcycle until you are sure the brakes are working properly.

FRONT MASTER CYLINDER (1978-1979)

NOTE
All 1978 and 1979 bikes were subject to a safety defect recall for possible brake fluid leakage at the master cylinder because some master cylinders were bored too large. Contact a Harley-Davidson dealer if you have not already done so.

NOTE
Some 1979 bikes were subject to a safety defect recall for possible brake fluid leakage through a cracked master cylinder body. Contact a Harley-Davidson dealer if you have not already done so.

FRONT MASTER CYLINDER (1982 AND LATER)

The front brake master cylinder was changed in 1982; see **Figure 68**.

WARNING
The installation of a back-up disc where it is not required can cause brake drag or brake lockup.

Disassembly

1. Open the front caliper bleeder valve(s) and drain the brake fluid by operating the hand lever.
2. Remove the union bolt and disconnect the brake line at the front of the caliper.
3. Remove the master cylinder cover and gasket.
4. Remove the hand lever pivot pin circlip, then remove the pivot pin and hand lever.
5. Remove the reaction pin from the hand lever.
6. Remove the master cylinder bolts and remove the master cylinder housing from the handlebar.
7. Referring to **Figure 68**, remove the following in order:
   a. Pushrod and switch actuator (22).
   b. Dust boot (21).
   c. Piston and O-ring (19 and 20).
   d. Back-up disc (18).

NOTE
*The 1984 FL and FX models do not use the back-up disc (18, **Figure 68**) because of a design change to the master cylinder piston.*

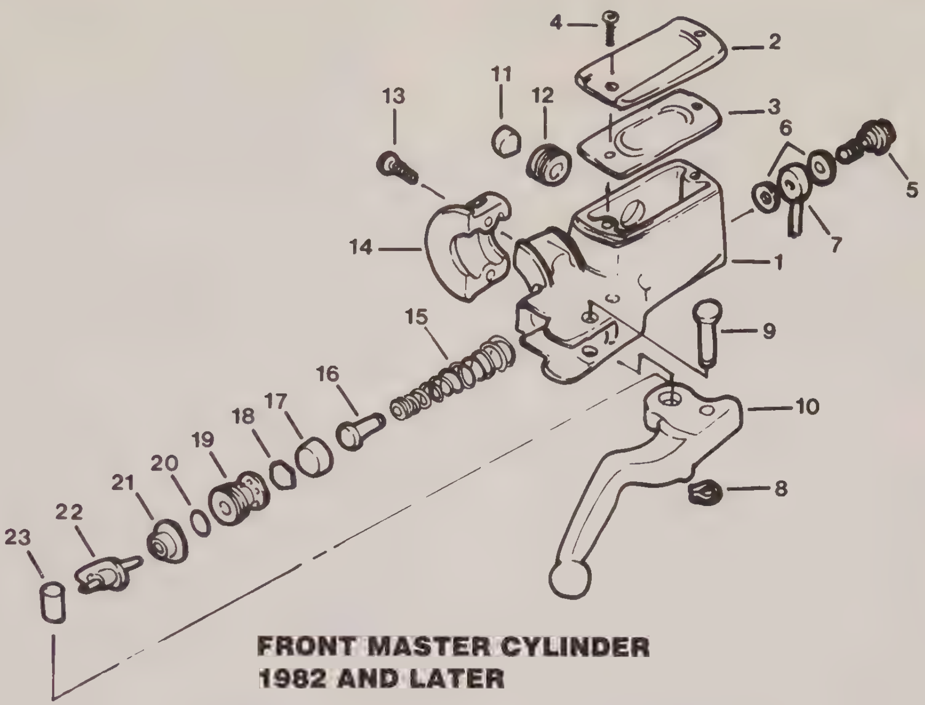
   e. Cup (17).
   f. Stop (16).
   g. Spring (15).

8. If damaged, remove the grommet and sight glass from the rear side of the master cylinder housing.

Inspection

1. Carefully inspect the O-ring, cup, dust boot and grommet for softening or wear. Replace these parts if required.
2. Inspect the master cylinder walls for scratches or wear grooves. The master

68



FRONT MASTER CYLINDER
1982 AND LATER

1. Master cylinder
2. Master cylinder cover
3. Gasket
4. Screws (2)
5. Banjo bolt
6. Washers (2)
7. Hydraulic line
8. Retaining ring
9. Pivot pin
10. Brake lever
11. Sight glass
12. Grommet
13. Screws (2)
14. Clamp
15. Spring
16. Stop
17. Cup
18. Back up disc
19. Piston
20. O-ring
21. Dust boot
22. Pushrod and switch
23. Reaction pin

cylinder housing should be replaced if the cylinder walls are damaged.

3. Check to see that the vent hole in the cover is not plugged.

Assembly

1. Coat all internal parts in DOT 5 brake brake fluid before assembly.
2. Install the grommet and sight glass if removed.
3. Referring to **Figure 68**, install the following parts in order:

a. Spring (15).
b. Stop (16).
c. Cup (17).
d. Back-up disc (18).

WARNING
*The back-up disc (18, **Figure 68**) is not used on 1984 FL and FX models. Installation of the back-up disc on these models may cause brake drag or brake lockup.*

4. With the piston (19, **Figure 68**) facing in the correct direction, assemble the O-ring,

boot and pushrod and switch onto the piston. Then install this assembly into the master cylinder housing.

5. Lightly coat the reaction pin with Loctite Anti-seize.

Referring to **Figure 68**, assemble the brake lever as follows:

a. Install the reaction pin into the large hole in the brake lever.

b. Position the brake lever into the master cylinder, making sure the end of the pushrod fits into the hole in the reaction pin.

NOTE
*Make sure the pushrod and switch (22, **Figure 68**) are fully seated in the reaction pin hole (23, **Figure 68**). If the hand lever binds or is not smooth in action, disassemble the parts and reassemble them correctly.*

c. Insert the pivot pin through the master cylinder and engage the brake lever. Secure the pivot pin with the circlip.

6. Install the master cylinder onto the handlebar. Tighten the screws to 70-80 in.-lb.

7. Connect the hydraulic line to the master cylinder using the correct washers and banjo bolt. Tighten the bolt to 20-25 ft.-lb.

8. Fill the master cylinder with new DOT 5 hydraulic brake fluid. Bleed the brake system as described under *Bleeding Hydraulic System* in Chapter Seven of the basic book.

NOTE
When actuating the brake lever in Step 8, a small spurt of fluid should break through the fluid surface in the master cylinder to indicate that all internal master cylinder components are working properly.

9. Install the master cylinder gasket and cover after bleeding the brakes.

WARNING
Do not ride the motorcycle until you are sure the brakes are working properly.

REAR MASTER CYLINDER (1978-1979)

NOTE
Some 1978-1979 bikes were subject to a safety defect recall for possible faulty rear master cylinder pistons. The pistons are made of plastic that can swell when the moisture content of the brake fluid is too high. This could cause a dragging brake or brake lockup. Contact a Harley-Davidson dealer if you have not already done so. Use only DOT 5 brake fluid.

REAR MASTER CYLINDER (LATE 1979-1983 FL/FXE AND LATE 1979-1982 FX)

Refer to **Figure 69** for this procedure.

Disassembly

1. Disconnect the brake line at the master cylinder.

2. Remove the master cylinder assembly.

3. Remove the cover and gasket. Drain and discard the brake fluid from the master cylinder.

4. Pull the rubber boot off the end of the master cylinder and remove the following parts in order:

a. Retaining ring (5).
b. Piston assembly (11).
c. Back-up disc (10).

NOTE
*The 1984 FL models do not use the back-up disc (10, **Figure 69**) because of a design change to the master cylinder piston.*

d. Piston cup (9).
e. Spring seat (8).
f. Spring (7).

5. Remove the O-ring from the piston.

Inspection

1. Carefully inspect the O-ring, cup, dust boot and grommet for softening or wear. Replace these parts if required.

2. Inspect the master cylinder walls for scratches or wear grooves. The master cylinder housing should be replaced if the cylinder walls are damaged.

3. Check to see that the vent hole in the cover is not plugged.

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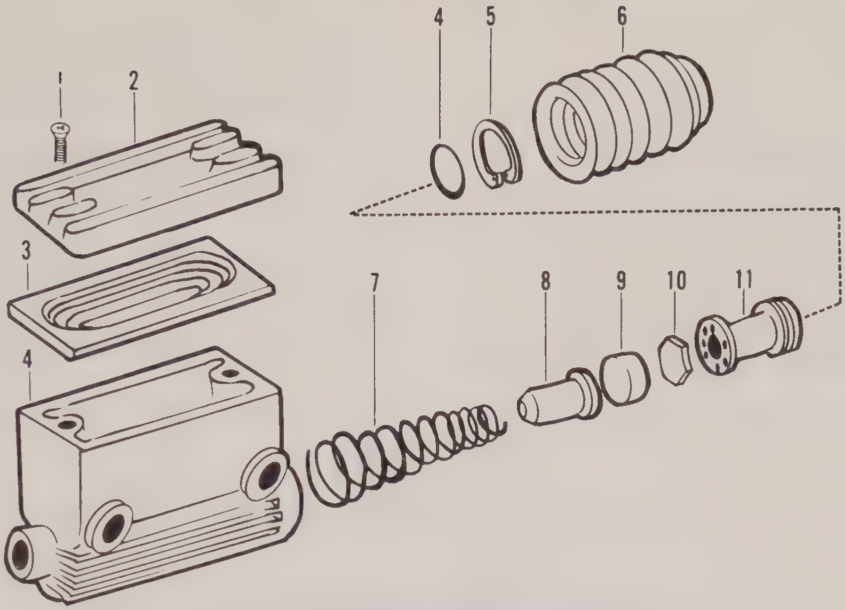


REAR BRAKE MASTER CYLINDER
(LATE 1979 AND LATER)

1. Cover screw (2)
2. Cover
3. Gasket
4. Master cylinder
5. Retaining ring
6. Boot
7. Spring
8. Spring seat
9. Piston cup
10. Back-up disc
11. Piston
12. O-ring

Assembly

1. Coat all internal parts in DOT 5 brake brake fluid before assembly.
2. Referring to **Figure 69**, install the following parts in order:
   a. Spring (7).
   b. Piston cup (9).
   c. Back-up disc (10).

WARNING
*The back-up disc (10, **Figure 69**) is not used on 1984 FL models. Installation of the disc on this model may cause brake drag or brake lockup.*

3. Install the O-ring on the piston.
4. Insert the piston assembly into the master cylinder. Install the circlip in the end of the master cylinder housing.
5. Install the boot onto the master cylinder.
6. Install the master cylinder on the motorcycle.
7. Connect the hydraulic line to the master cylinder.
8. Fill the master cylinder with new DOT 5 hydraulic brake fluid. Bleed the brake system as described under *Bleeding Hydraulic System* in Chapter Seven of the basic book.

NOTE
When actuating the brake lever in Step 8, a small spurt of fluid should break through the fluid surface in the master cylinder to indicate that all internal master cylinder components are working properly.

9. Install the master cylinder gasket and cover after bleeding the brakes.

10. Adjust the master cylinder plunger free play as described under *Rear Brake Adjustment* in this supplement.

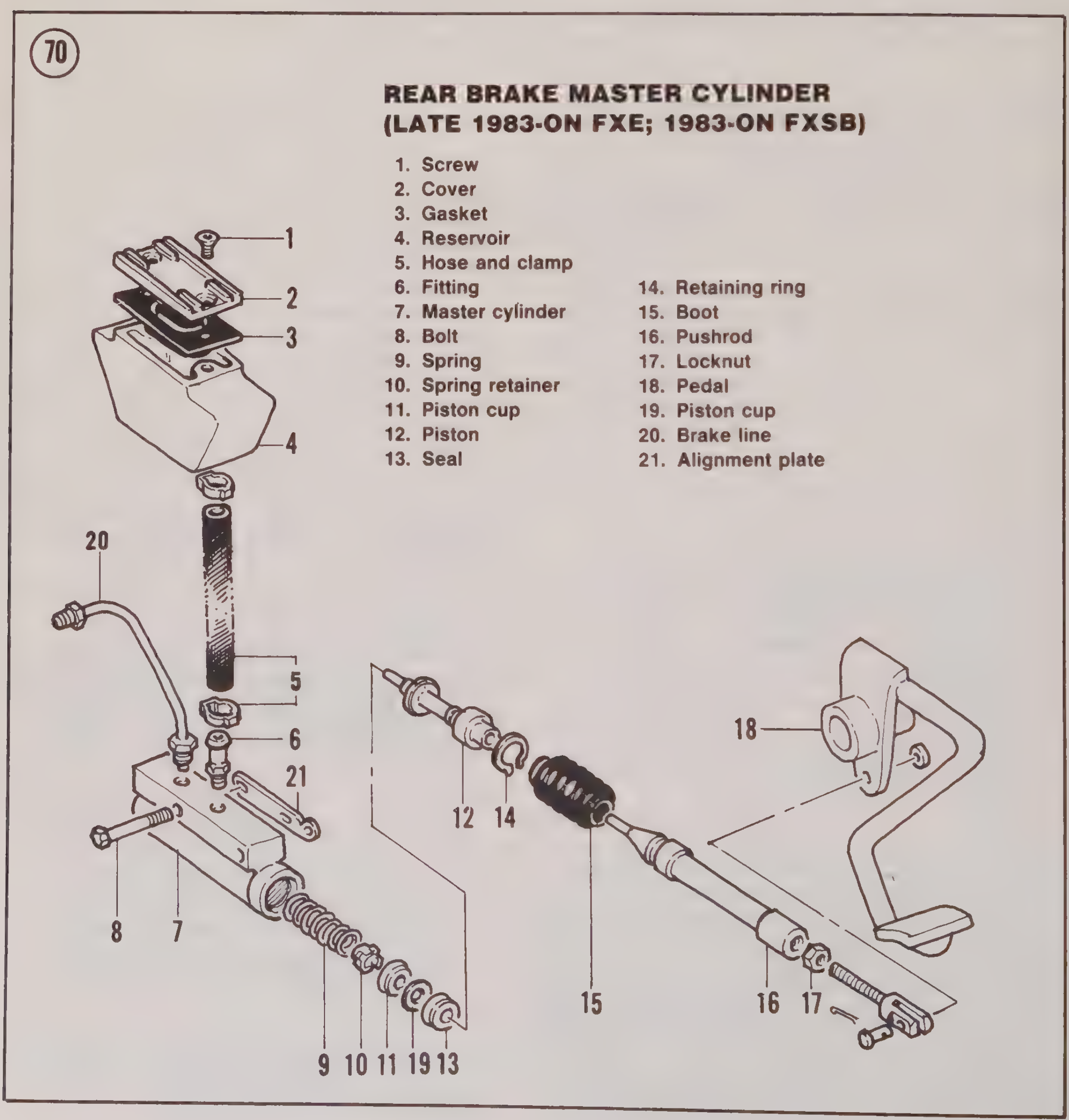
WARNING
Do not ride the motorcycle until you are sure the brakes are working properly.

REAR MASTER CYLINDER (LATE 1983-ON FXE AND 1983-ON FXSB)

Service and repair are essentially the same as for *Rear Master Cylinder (Late 1979-1983 FL/FXE and Late 1979-1982 FX)* models described in this supplement. Refer to **Figure 70** when performing service to this unit. Adjust the brake pedal height and pushrod free play as described in this supplement.

REAR MASTER CYLINDER (1983-ON FLHS AND FXWG)

Service and repair are essentially the same as for *Rear Master Cylinder (Late 1979-1983 FL/FXE and Late 1979-1982 FX)* models described in this supplement. Refer to **Figure**



(70)

REAR BRAKE MASTER CYLINDER (LATE 1983-ON FXE; 1983-ON FXSB)

1. Screw
2. Cover
3. Gasket
4. Reservoir
5. Hose and clamp
6. Fitting
7. Master cylinder
8. Bolt
9. Spring
10. Spring retainer
11. Piston cup
12. Piston
13. Seal
14. Retaining ring
15. Boot
16. Pushrod
17. Locknut
18. Pedal
19. Piston cup
20. Brake line
21. Alignment plate

71 when performing service to this unit. Adjust the brake pedal height and pushrod free play as described in this supplement.

COMFORT FLEX SEAT

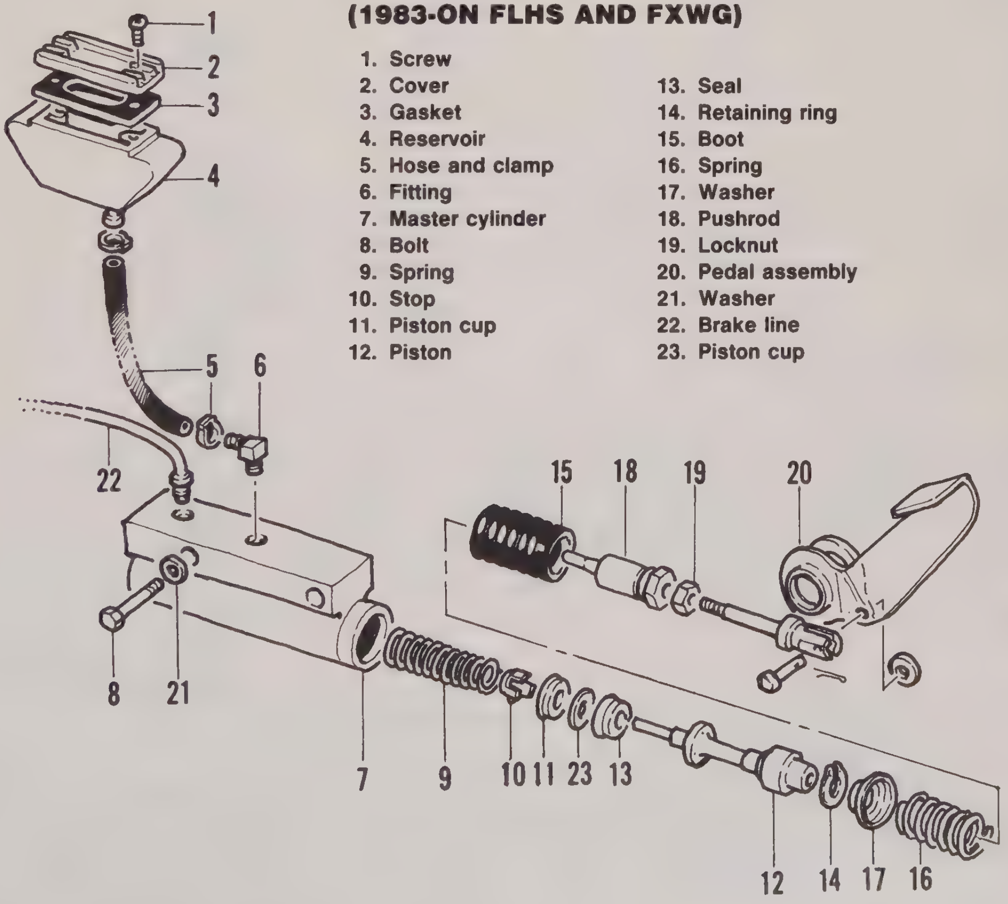
The Comfort Flex seat was introduced in 1977 and modified in 1981. It has adjustable seat spring preload and damping and it can be raised for battery and oil tank access. An occasional greasing of the seat post spring assembly and linkage pivots will assure smooth operation. *Do not* grease the friction dampers.

See **Figure 72**. To adjust the damping, remove the lock ring (6) and tighten or loosen the castellated nut (8) on the friction damper. Install the lock ring after adjusting damping.

NOTE
Overall seat post spring preload can be adjusted by loosening the locknut and turning the adjuster nut under the seat post spring to vary the spring preload. Stay within the dimensions shown in ***Figure 73****. For routine seat spring preload adjustment, see the following sections.*

Adjustment
(1977-1980)

1. See **Figure 72**. Remove the seat post pin (3).



REAR MASTER CYLINDER (1983-ON FLHS AND FXWG)

1. Screw
2. Cover
3. Gasket
4. Reservoir
5. Hose and clamp
6. Fitting
7. Master cylinder
8. Bolt
9. Spring
10. Stop
11. Piston cup
12. Piston
13. Seal
14. Retaining ring
15. Boot
16. Spring
17. Washer
18. Pushrod
19. Locknut
20. Pedal assembly
21. Washer
22. Brake line
23. Piston cup

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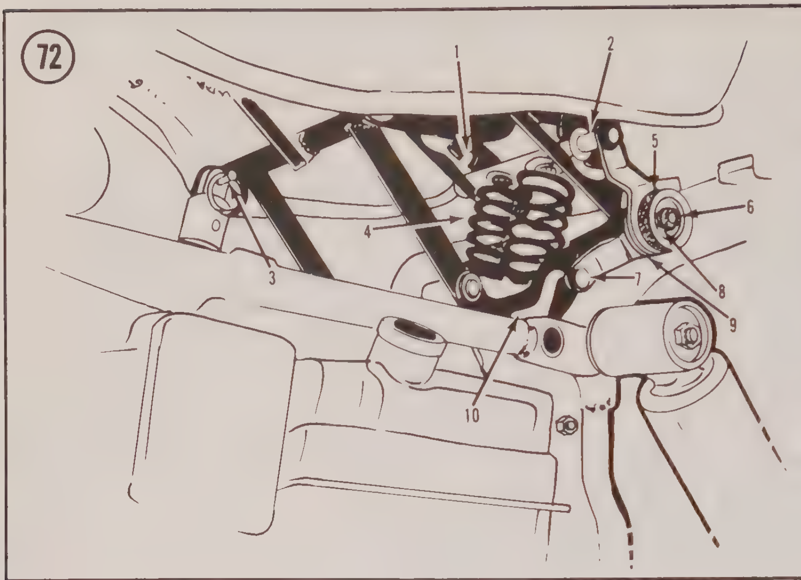
(72)



"COMFORT FLEX" SEAT

1. Spring adjusting slot
2. Spring adjusting cross rod
3. Seat post pin
4. Seat springs
5. Friction damper
6. Lock ring
7. Lower cross shaft
8. Castellated nut
9. Friction washer
10. Slot

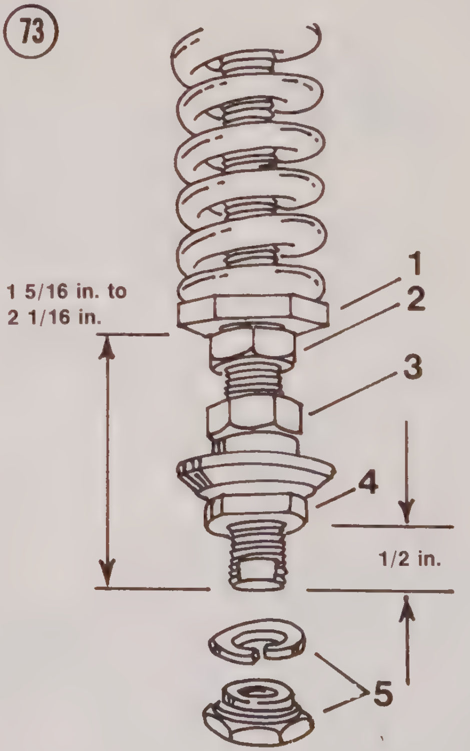
2. Slide the rear of the seat up so the lower cross shaft (7) slides up in its "S" slot.
3. Move the spring adjusting cross rod to any of the several spring adjusting slots (1). Moving the rod to the front makes the springing harder. In the far rear position there is no spring action.
4. Slide the lower cross shaft (7) back down to the bottom of its "S" slot.
5. Insert the seat post pin (3) in the seat post.

Disassembly/Assembly (1977-1980)

See **Figure 74** for disassembly and assembly. When assembling, the seat post height must be set at 3 in. from the bike frame to the center of the post pin hole (**Figure 75**); turn the rod nut (**Figure 73**) so 1/2 in. of the threaded seat rod shows at the bottom of the seat post spring.

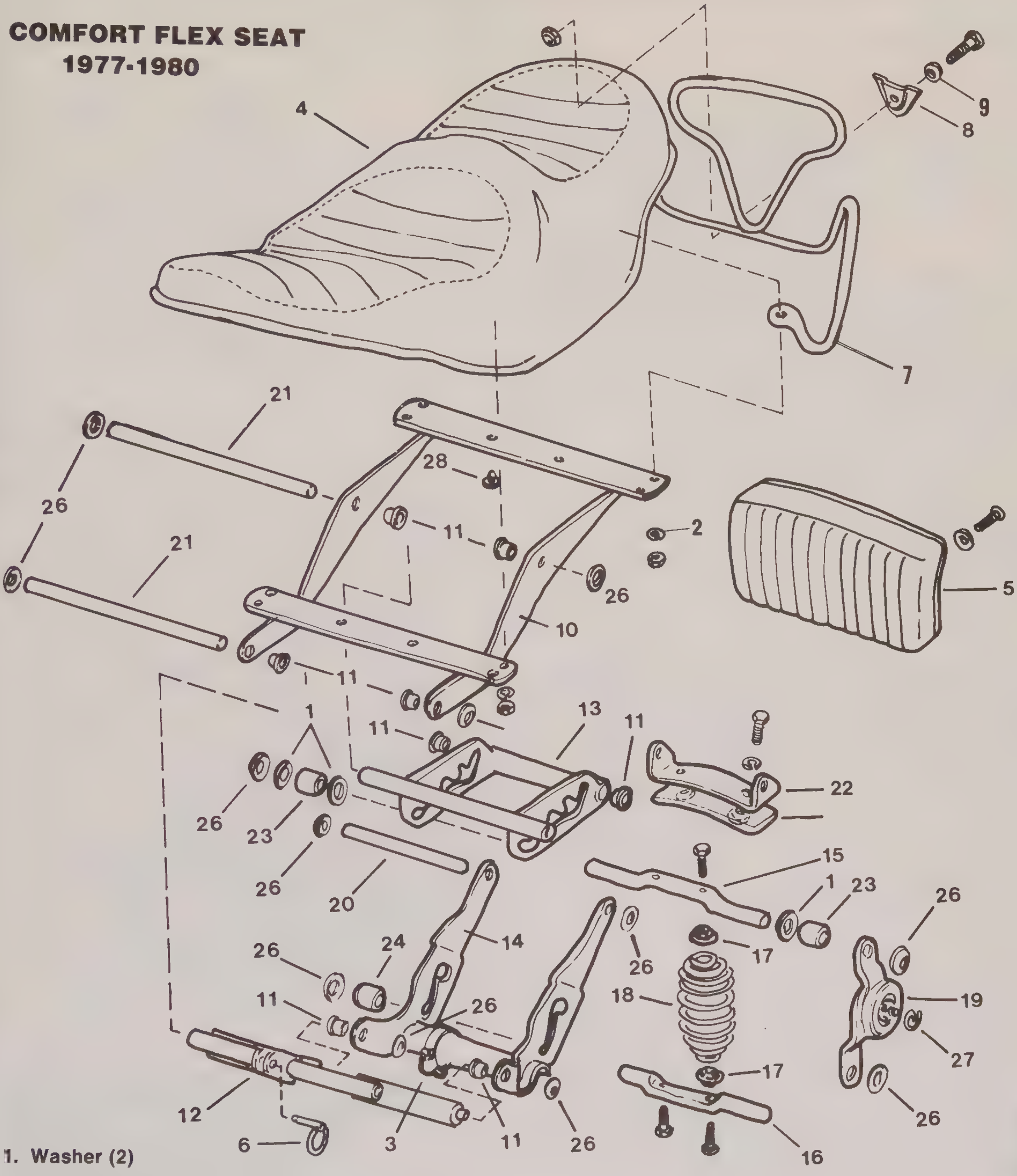
> *CAUTION*
> *The clamps securing the suspension base to the bike frame must have the screws to the front (**Figure 76**), or the support bracket and/or clamps may break. Check for adequate clearance for the gas tank and all accessories; adjust the seat post rod nut if required and add shim stock under the fender bracket if required.*

(73)



1. Tension adjust nut
2. Locknut
3. Rod locknut
4. Rod height adjust nut
5. Nut and washer

COMFORT FLEX SEAT
1977-1980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1. Washer (2)
2. Lockwasher (2)
3. Clamp, worm drive (2)
4. Seat
5. Backrest
6. Pin, seat post
7. Handrail assembly
8. Support plate, handrail
9. Locknut, support plate to handrail
10. Support, seat
11. Bushing (8)
12. Adjusting bracket, front
13. Adjusting bracket, rear
14. Seat suspension base
15. Bracket, spring mounting-upper
16. Bracket, spring mounting-lower
17. Retainer, spring
18. Spring, compression (2)
19. Damper, spring
20. Seat suspension base
21. Shaft, seat support (2)
22. Bracket, fender
23. Spacer, spring upper bracket
24. Spacer, spring lower bracket
25. Fender reinforcement
26. Speed nut
27. Lock ring
28. Rubber button

(74)

Adjustment (1981 and Later)

1. See **Figure 77**. Pull the release lever to the rear. Slide the rear of the seat up so the lower cross shaft slides up in its "S" slot.

2. See **Figure 72**. Move the spring adjusting cross rod to any of the several spring adjusting slots in the upper bracket. Moving the rod to the front makes the springing harder. In the far rear position there is no spring action.

3. To adjust the damping, remove the lock ring and tighten or loosen the castellated nut on the friction damper. Install the lock ring after adjusting damping.

4. See **Figure 77**. Lower the seat; the lower cross shaft must be at the bottom of the "S" slot and the bracket should engage the release mechanism.

Disassembly/Assembly (1981 and Later)

See **Figure 78** for disassembly and assembly. When assembling, the seat post height must be set at 3 in. from the bike frame to the center of the post pin hole (**Figure 75**); turn the rod nut (**Figure 73**) so 1/2 in. of the threaded seat rod shows at the bottom of the seat post spring.

CAUTION

Check for adequate clearance for the gas tank and all accessories; adjust the seat post rod nut if required and add shim stock under the fender bracket if required.

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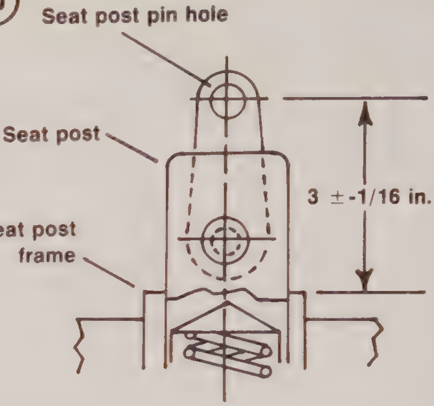

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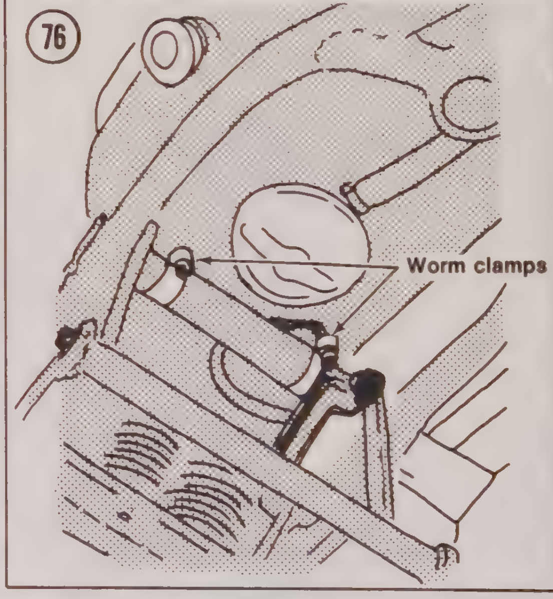

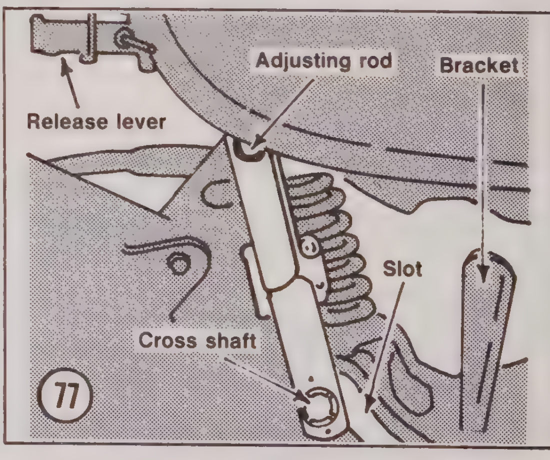

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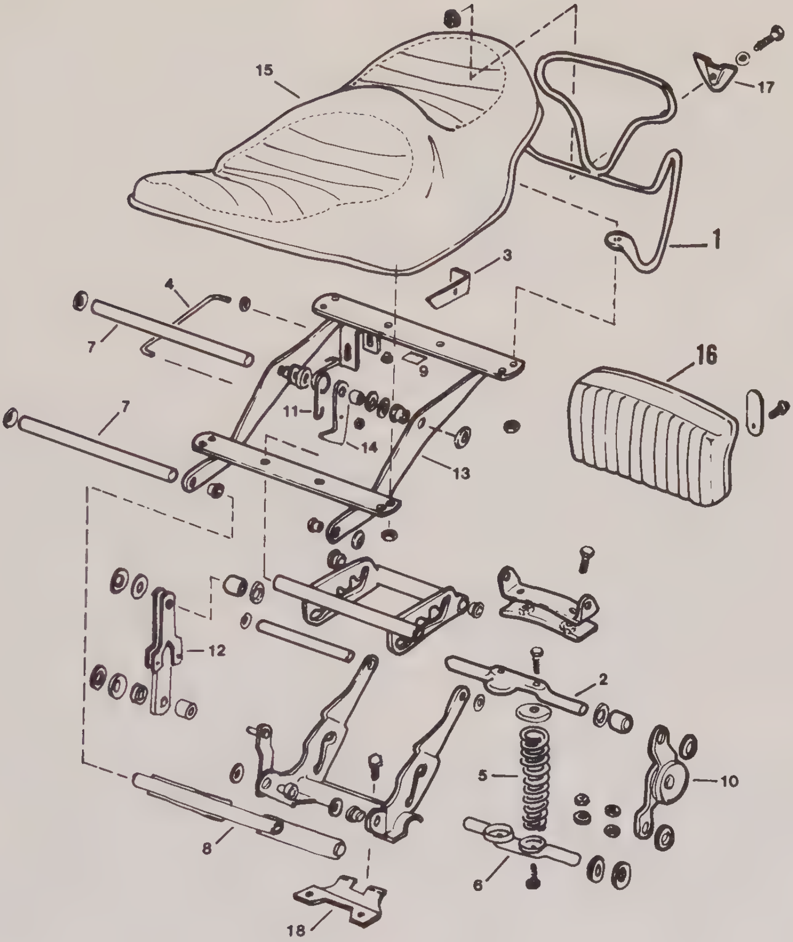

COMFORT FLEX SEAT
1981 AND LATER

1. Backrest support
2. Upper shaft assembly
3. Handle
4. Rod
5. Spring compression
6. Lower shaft assembly
7. Shaft
8. Front link
9. Bumper
10. Damper
11. Spring
12. Slider assembly
13. Seat support
14. Hook
15. Seat
16. Backrest assembly
17. Support plate

CHAPTER NINE

BELT DRIVE

Primary and final drive by toothed rubber belts was introduced on the 1980 FXB and belt final drive was introduced on the 1982 FL Classic. See **Figure 79**. The belts should not be lubricated in any manner, but belt tension must be inspected according to the maintenance schedule (**Table 1**). On models with belt final drive, a revised starter drive is used to clear the belt; see *Electric Starter Drive* in the Chapter Four section in this supplement.

On models with belt primary drive, the primary chain oiler is eliminated. This allows the "dry" clutch to run drier. The new clutch hub bearings on these models require greasing according to the maintenance schedule (**Table 1**). Also, the rubber dampers at the crankshaft compensating sprocket require periodic lubrication according to the maintenance schedule (**Table 1**).

CAUTION
If your bike develops unusual inner primary drive or transmission noises, take the motorcycle to your Harley-Davidson dealer for diagnosis and repair.

DRIVE BELT INSPECTION

The drive belts have a built-in polyethylene lubricant coating that burnishes off during break-in. Do not apply any lubricants. Inspect the belt tension according to the maintenance schedule (**Table 1**).

Primary Drive Belt Inspection

Inspect the belt according to the maintenance schedule (**Table 1**). Some models have adjustable primary belt tension. On other models, the belt must be replaced when slack is too great.

1. Remove the primary drive cover.
2. Apply 10 lb. of force to the middle of the belt run. Deflection of the belt should be 5/8 to 1 in. (**Figure 80**).
3. If deflection exceeds the specification, adjust as described in this section of the supplement or install a new belt.

NOTE
When installing the primary belt cover, make sure you install the one short bolt in the bottom hole toward the front of the cover.

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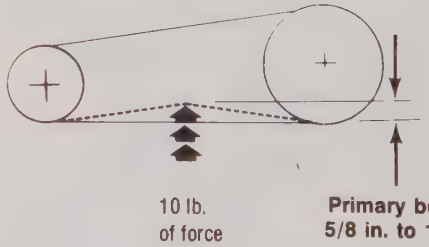

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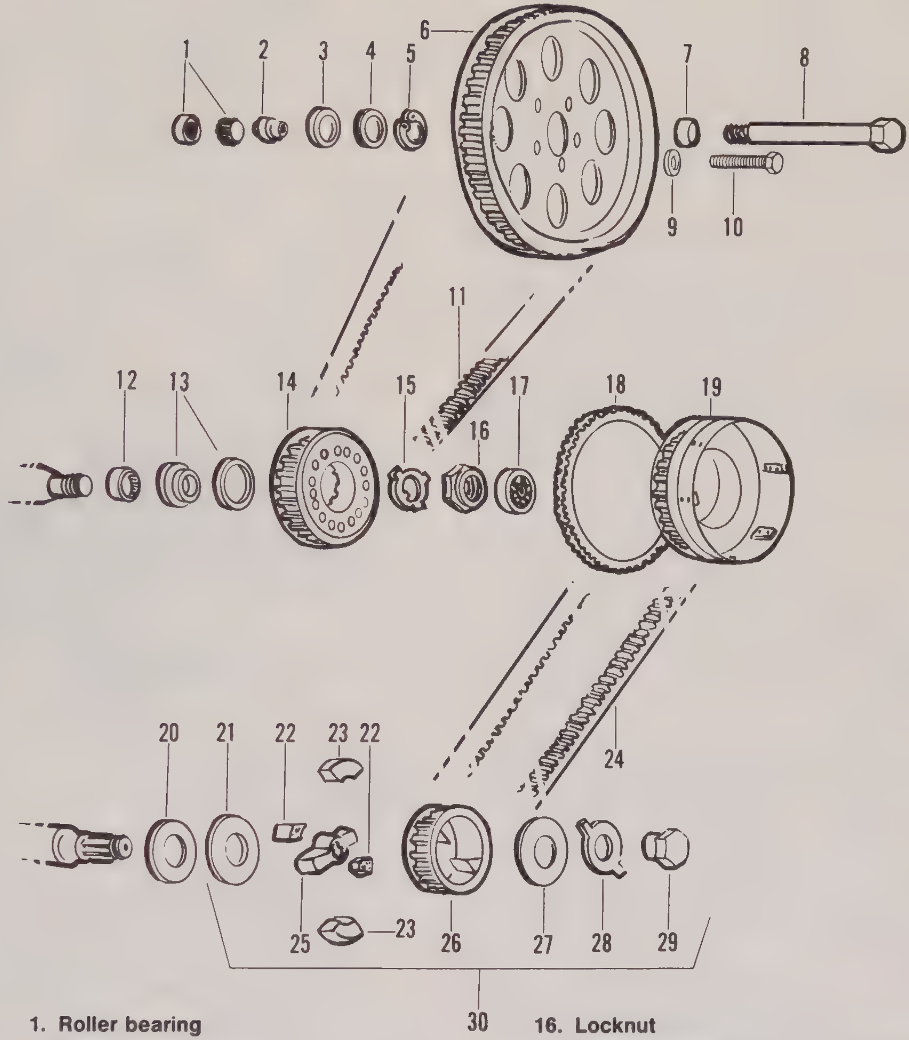
BELT DRIVE SYSTEM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1. Roller bearing	16. Locknut
2. Spacer	17. Roller bearing (not on FLH 80 classic)
3. Oil seal	18. Starter ring
4. Washer	19. Clutch sprocket assembly
5. Retaining ring	20. Spacer
6. Wheel sprocket	21. Bearing disc
7. Spacer	22. Small damper
8. Axle	23. Large damper
9. Washer	24. Primary belt
10. Bolt	25. Compensator drive hub
11. Rear belt	26. Compensating sprocket
12. Needle bearing	27. Flange bearing
13. Oil seal	28. Lockwasher
14. Transmission sprocket	29. Nut
15. Lockwasher	30. Compensating sprocket assembly

Primary Drive Belt Adjustment

Late 1981 and later models have adjustable primary belt tension.

1. Remove the safety wire from the 4 bolts securing the primary drive housing to the crankcase (**Figure 81**). Loosen the bolts.
2. Loosen the 4 bottom nuts securing the transmission to the transmission mounting plate.
3. Loosen the bolt securing the transmission to the frame.
4. Loosen the 2 starter motor and bracket mounting nuts on the right end of the starter, at the top.
5. To tighten the belt, pry against the crankcase with a screwdriver inserted through the hold in the primary drive housing (**Figure 81**).

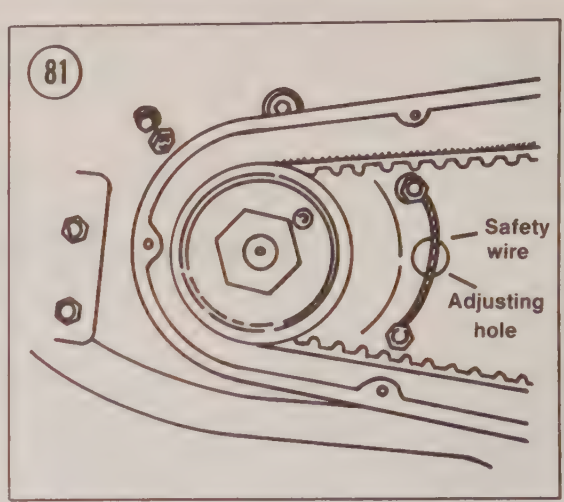
NOTE
Some late 1981 models have no hole drilled in the primary housing. On these models, pry carefully between the alternator rotor and the primary housing.

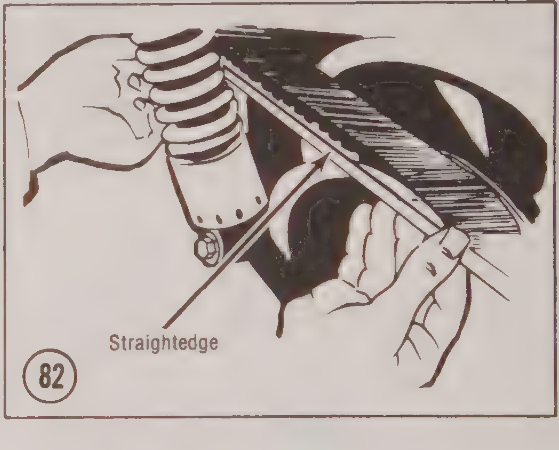
6. When belt tension is correct, tighten the 2 inner crankcase mounting bolts lightly. Recheck belt tension and readjust if necessary. Torque the 4 crankcase bolts to 19 ft.-lb.
7. Install new safety wire through the 2 inner crankcase bolts.

CAUTION
If you do not install safety wire through these bolts, a bolt could back out unnoticed and cause severe engine damage.

8. Torque the 4 bottom transmission/plate nuts and the 1 transmission/frame nut to 20 ft.-lb.
9. Tighten the 2 starter mounting nuts.
10. After adjusting primary belt tension, check and adjust the following:
    a. Final drive belt (see *Final Belt* in this chapter).
    b. Rear brake pedal free play (see *Rear Brake Pedal Adjustment, Late Super Glide* in Chapter Seven of the basic book).
    c. Clutch (see *Clutch Control Adjustment, Late 1979 and Later* in the Chapter Four section of this supplement).
    d. Shift linkage from the shift pedal to the transmission.

81





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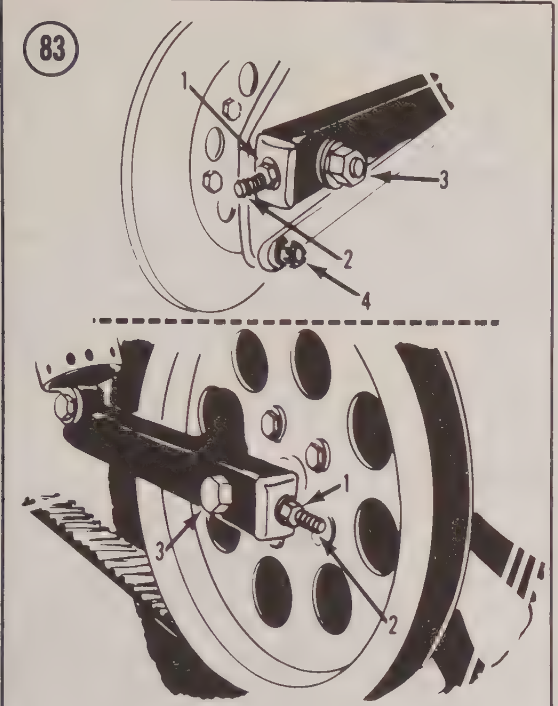
Final Drive Belt Inspection

The final drive belt stretches very little after the first 500 miles of operation, but it should be inspected for tension and alignment according to the maintenance schedule (**Table 1**).

1. Have a normal weight rider sit on the seat with the wheels on the ground.
2. Apply 10 lb. of force to the middle of the belt run. Deflection of the belt should be 5/8 to 3/4 in. (**Figure 80**).
3. Remove the belt guard and check the sprocket alignment. Place a straightedge along the side of the rear sprocket near the top



1. Axle adjusting nuts
2. Axle adjusting studs
3. Axle nut
4. Brake anchor nut and cotter pin

(**Figure 82**). There should be an equal space between the belt and the straightedge all along the belt.

4. If belt tension or alignment is out of specification, adjust as described in this section of the supplement.

Final Drive Belt Adjustment

Refer to **Figure 83** for this procedure. When adjusting the final drive belt, you must also maintain rear wheel and sprocket alignment. A misaligned rear wheel will drastically shorten belt life and it may cause poor handling and pulling to one side or the other. Once the alignment is set correctly, if both adjusters are moved an equal amount, the rear wheel will be aligned correctly.

1. Loosen the axle nut.
2. Remove the brake anchor cotter pin and loosen the anchor nut.
3. If the belt was too tight, back out both adjuster nuts an equal amount and kick the rear wheel forward or tap on the edges of the axle until the belt is looser than desired.
4. Turn both adjuster nuts in an equal amount gradually until the belt tension is within specification. If sprocket realignment is required, turn one adjuster more than the other.
5. Torque the axle nut to 50 ft.-lb. and recheck belt tension and alignment.
6. Tighten the brake anchor nut and install a new cotter pin. Spread the ends of the cotter pin.
7. Install the belt guard.

DRIVE BELT REMOVAL/INSTALLATION

Refer to **Figure 79**. The primary drive belt must be removed before the final drive belt can be removed.

Primary Drive Belt Removal/Installation

NOTE

*Primary drive belt alignment is determined by the number and thickness of spacers (item 20 in **Figure 79**) between the alternator and the bearing disc (21). If you remove the spacer(s), be sure to install them exactly as removed.*

1. Remove the primary drive cover.
2. Flatten the lockwasher tabs (28) and remove the compensating sprocket nut (29), and lockwasher.
3. On models with a setscrew in the flange bearing (27), remove the setscrew.
4. Remove the flange bearing (27) and loosen the sprocket from the sprocket shaft. A bearing puller may be required.
5. Remove the clutch inner parts; see *Clutch Removal* in Chapter Four of the basic book.
6. Remove the clutch housing/sprocket assembly (19) and the engine sprocket (14), along with the belt.
7. To install, reverse these steps. Note the following:
   a. If you lost track of how many spacers (20) go between the alternator and bearing disc (21) or if you are assembling new parts, see *Primary Belt Alignment* in this section of the supplement.

b. Grease the primary drive housing roller bearing (17).
c. Lubricate the 4 rubber dampers (23, 25) with Harley-Davidson "Poly-Oil" and install them as shown in **Figure 84**.
d. Torque the compensating sprocket nut to 90 ft.-lb.
e. Adjust the clutch; see *Clutch Control Adjustment (Late 1979 and Later)* in the Chapter Four section of this supplement.

Primary Belt Alignment

1. Measure the distance from the alternator rotor hub to the primary drive housing gasket surface (A, **Figure 85**).
2. Measure the distance from the clutch hub friction surface to the primary drive housing gasket surface (B, **Figure 85**).
3. Subtract measurement B from A to obtain C.
4. Select the proper spacer thickness from **Table 11.**

Final Drive Belt Removal/Installation

Before the final drive belt can be replaced, the rear wheel, swing arm and primary drive must be removed.

1. Remove the primary drive belt or chain.
2. Remove the clutch housing, starter housing and primary drive inner housing; see *Preparation for Engine Disassembly* in Chapter Three of the basic book. Transmission removal is not required, but the transmission mounting bolts should be loosened for easy alignment on assembly.
3. Remove the rear wheel and swing arm; see *Rear Wheel Removal* and *Swing Arm Removal* in Chapter Seven of the basic book.

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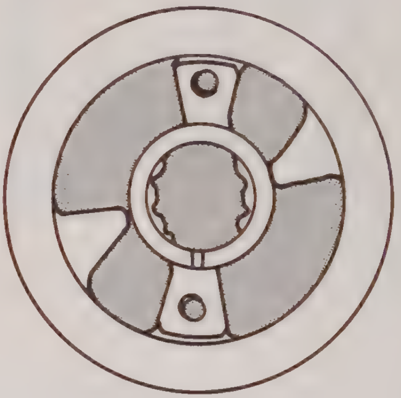

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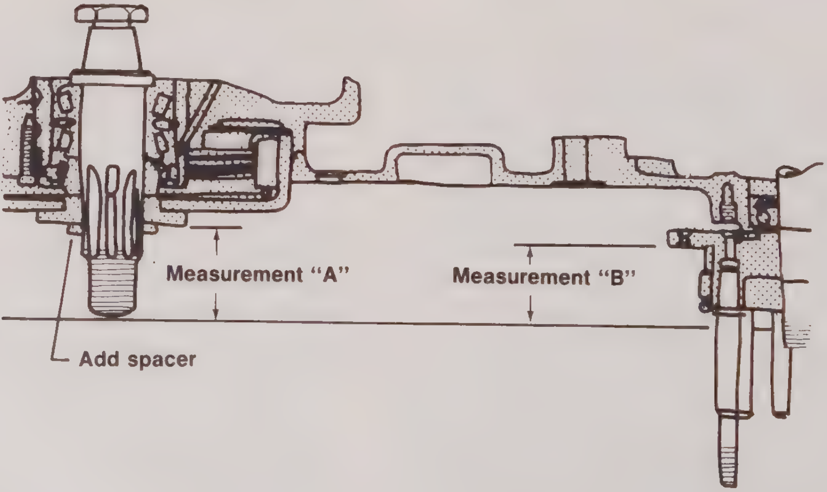

4. Pull the final drive belt off the transmission belt sprocket and thread it out past the end of the swing arm.

NOTE
Whenever the final drive belt has been removed, inspect the transmission main shaft bearing (item 12 in ***Figure 79****) closely for wear or damage.*

5. To install a new belt, reverse these steps. Note the following:
   a. Clean and lubricate the swing arm bearings. Inspect them for wear.
   b. Adjust the final drive belt tension after assembly, and again after 500 miles of use.

SPROCKET DAMPER AND CLUTCH BEARING LUBRICATION

The compensating sprocket rubber dampers and the clutch hub roller bearing should be lubricated according to the maintenance schedule (**Table 1**); see *Primary Drive Belt Removal* in this section of the supplement.

Table 11 PRIMARY BELT ALIGNMENT

Dimension C	Spacer thickness
0.324-0.304 in.	0.060 in.
0.304-0.284 in.	0.040 in.
0.284-0.264 in.	0.020 in.
0.264-0.254 in.	0.010 in.
0.254-0.244 in.	none

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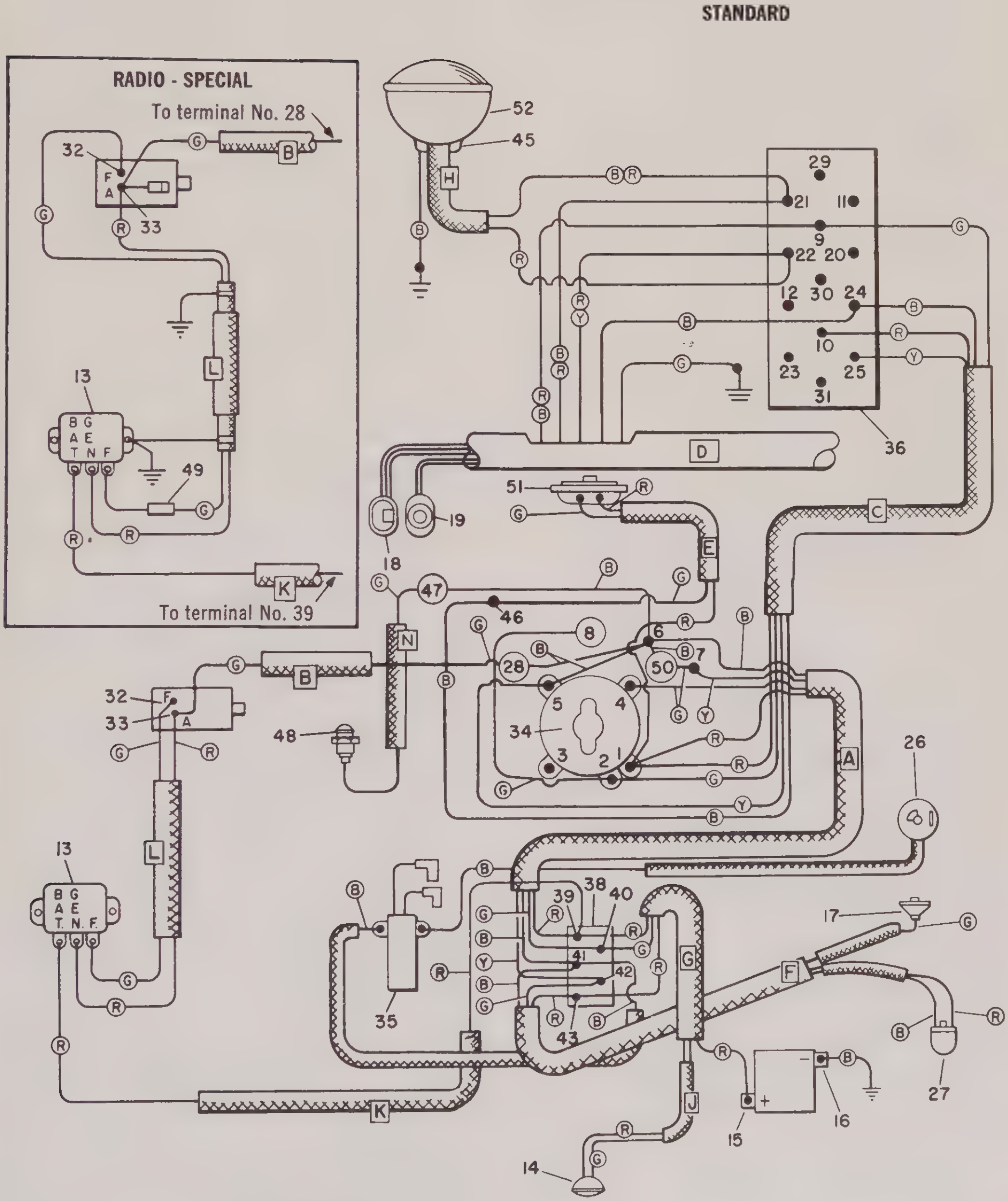
1959 DUO-GLIDE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1959 DUO-GLIDE

A. Conduit (4 wire)—red, green, black, and yellow
B. Conduit (1 wire)—green
C. Conduit (4 wire)—red, green, yellow, and black
D. Handlebar (loose wires)—red with black tracer, black with red tracer, red with yellow tracer, black, and green
E. Conduit (2 wire)—red and green
F. Conduit (3 wire)—black, green, and red
G. Conduit (3 wire)—red, green, and red
H. Conduit (3 wire)—black with red tracer and red
J. Conduit (2 wire)—red and green
K. Conduit (1 wire)—red
L. Conduit (2 wire)—green and red
N. Conduit (1 wire)—green

1. Switch terminal—3 red wires
2. Switch terminal—2 green wires
3. Switch terminal—not used with standard wiring
4. Switch terminal—green wire
5. Switch terminal—black and yellow wires
6. Junction terminal—5 black wires
7. Junction terminal—green, yellow wires
8. Speedometer light—green wire
9. Terminal—red with black tracer, green wire
10. Terminal—red wire
11. Terminal—not used with standard wiring
12. Terminal—not used with standard wiring
13. Regulator—2 red, green wires
14. Tail- and stoplight—green, red wires
15. Battery positive terminal—red wire
16. Battery negative terminal—black wire
17. Oil pressure signal switch—green wire
18. Handlebar headlight switch—red with black tracer, black tracer, black with red tracer, red with yellow tracer
19. Horn switch—black, green wires
20. Terminal—not used with standard wiring
21. Terminal—2 black wires with red tracer
22. Terminal—red wire, red with yellow tracer
23. Terminal—not used with standard wiring
24. Terminal—2 black wires
25. Terminal—yellow wire
26. Ignition circuit breaker—black wire
27. Stoplight switch—black, red wires
28. Generator signal light—green, black wires
29. Terminal—not used with standard wiring
30. Terminal—not used with standard wiring
31. Terminal—not used with standard wiring
32. Generator (F) terminal—green wire
33. Generator (A) terminal—red with green wires
34. Ignition—light switch—see terminals 1 through 5
35. Ignition coil—2 black wires
36. Terminal plate—see 10 and terminals 20 through 24
38. Terminal box—see terminals 39 through 43
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40. Terminal—2 green wires
41. Terminal—3 black wires
42. Terminal—yellow, green wires
43. Terminal—2 red wires
45. Headlight bracket—black wire
46. Junction terminal—black, green wires
47. Neutral indicator light—black, green wires
48. Neutral indicator switch—green wire
50. Oil signal light—black and green wires
51. Horn—red and green wires
52. Headlight—red wire, black with red tracer

WIRING DIAGRAM (RADIO-SPECIAL)

Wiring with radio equipment is unchanged except for regulator, generator, and battery connections.

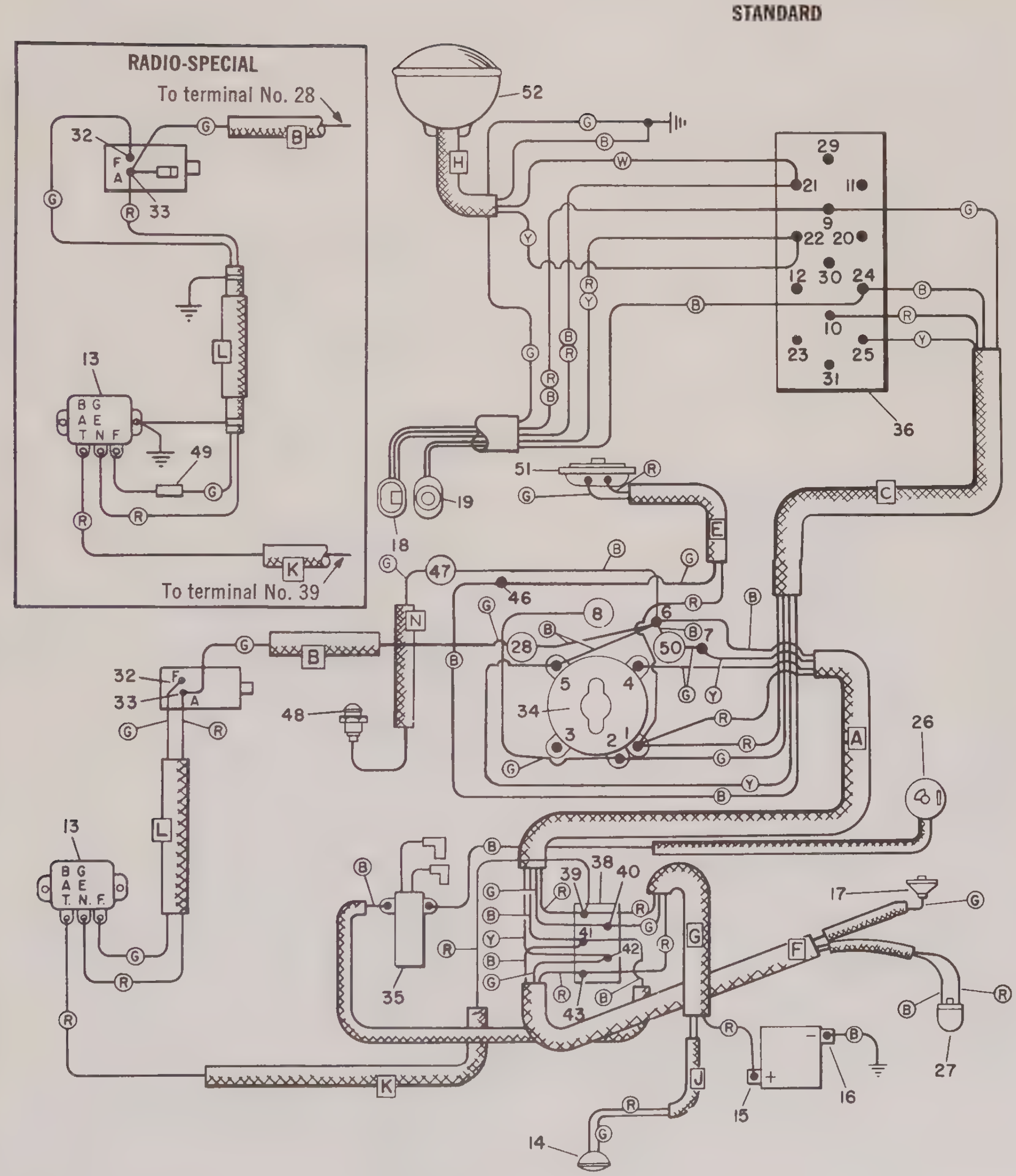
B. Conduit (1 wire)—green
G. Conduit (2 wire)—red and green
K. Conduit (1 wire)—red
L. Cable (2 wire)—red and green
M. Conduit (1 wire)—red (not shown)

13. Regulator—green and red wires
32. Generator (F) terminal—green wire
33. Generator (A) terminal—red wire
39. Terminal—red wire
49. Fuse

KEY TO COLOR CODE

R = Red
G = Green
B = Black
Y = Yellow
RB = Red with black tracer
BR = Black with red tracer
RY = Red with yellow tracer

1960 DUO-GLIDE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1960 DUO-GLIDE

A. Conduit (4 wire)—red, green, black, and yellow
B. Conduit (1 wire)—green
C. Conduit (4 wire)—red, green, yellow, and black
D. Handlebar (loose wires)—red with black tracer, black with red tracer, red with yellow tracer, black, and green
E. Conduit (2 wire)—red and green
F. Conduit (3 wire)—black, green, and red
G. Conduit (3 wire)—red, green, and red
H. Conduit (3 wire)—black, white, and yellow
J. Conduit (2 wire)—red and green
K. Conduit (1 wire)—red
L. Conduit (2 wire)—green and red
N. Conduit (1 wire)—green

1. Switch terminal—3 red wires
2. Switch terminal—2 green wires
3. Switch terminal—not used with standard wiring
4. Switch terminal—green wire
5. Switch terminal—black and yellow wires
6. Junction terminal—5 black wires
7. Junction terminal—green, yellow wires
8. Speedometer light—green wire
9. Terminal—red with black tracer, green wire
10. Terminal—red wire
11. Terminal—not used with standard wiring
12. Terminal—not used with standard wiring
13. Regulator—2 red, green wires
14. Tail- and stoplight—green, red wires
15. Battery positive terminal—red wire
16. Battery negative terminal—black wire
17. Oil pressure signal switch—green wire
18. Handlebar headlight switch—red with black tracer, black with red tracer, red with yellow tracer
19. Horn switch—black, green wires
20. Terminal—not used with standard wiring
21. Terminal—2 black wires with red tracer
22. Terminal—red wire, red with yellow tracer
23. Terminal—not used with standard wiring
24. Terminal—2 black wires
25. Terminal—yellow wire
26. Ignition circuit breaker—black wire
27. Stoplight switch—black, red wires
28. Generator signal light—green, black wires
29. Terminal—not used with standard wiring
30. Terminal—not used with standard wiring
31. Terminal—not used with standard wiring
32. Generator (F) terminal—green wire
33. Generator (A) terminal—red and green wires
34. Ignition—light switch—see terminals 1 through 5
35. Ignition coil—2 black wires
36. Terminal plate—see 10 and terminals 20 through 24
38. Terminal box—see terminals 39 through 43
39. Terminal—3 red wires
40. Terminal—2 green wires
41. Terminal—3 black wires
42. Terminal—yellow, green wires
43. Terminal—2 red wires
45. Terminal plate top mounting screw (ground)
46. Junction terminal—black, green wires
47. Neutral indicator light—black, green wires
48. Neutral indicator switch—green wire
50. Oil signal light—black and green wires
51. Horn—red and green wires
52. Headlight—black, white, and yellow wires

WIRING DIAGRAM (RADIO-SPECIAL)

Wiring with radio equipment is unchanged except for regulator, generator, and battery connections.

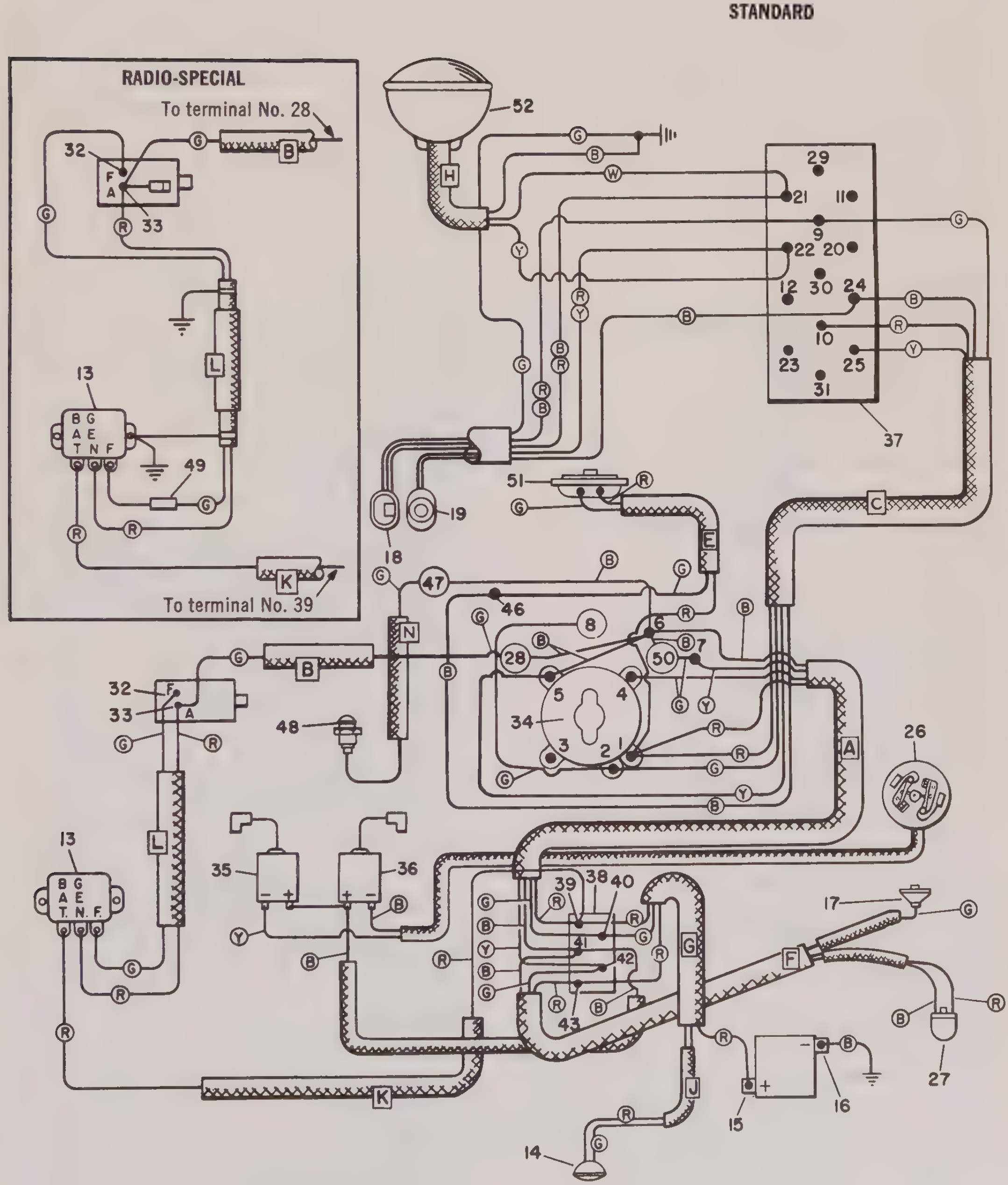
B. Conduit (1 wire)—green
G. Conduit (2 wire)—red and green
K. Conduit (1 wire)—red
L. Cable (2 wire)—red and green
M. Conduit (1 wire)—red (not shown)

13. Regulator—green and red wires
32. Generator (F) terminal—green wire
33. Generator (A) terminal—red wire
39. Terminal—red wire
49. Fuse

KEY TO COLOR CODE

R = Red
G = Green
B = Black
Y = Yellow
W = White
RB = Red with black tracer
BR = Black with red tracer
RY = Red with yellow tracer

1961-1964 DUO-GLIDE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RADIO-SPECIAL
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To terminal No. 39
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1961-1964 DUO-GLIDE

A. Conduit (4 wires)—red, green, black, and yellow
B. Conduit (1 wire)—green
C. Conduit (4 wire)—red, green, yellow, and black
D. Handlebar (loose wires)—red with black tracer, black with red tracer, red with yellow tracer, black, and green
E. Conduit (2 wire)—red and green
F. Conduit (3 wire)—black, green, and red
G. Conduit (3 wire)—red, green, and red
H. Conduit (3 wire)—black, white, and yellow
J. Conduit (2 wire)—red and green
K. Conduit (1 wire)—red
L. Conduit (2 wire)—green and red
N. Conduit (1 wire)—green

1. Switch terminal—3 red wires
2. Switch terminal—2 green wires
3. Switch terminal—not used with standard wiring
4. Switch terminal—green wire
5. Switch terminal—black and yellow wires
6. Junction terminal—5 black wires
7. Junction terminal—green, yellow wires
8. Speedometer light—green wire
9. Terminal—red with black tracer, green wire
10. Terminal—red wire
11. Terminal—not used with standard wiring
12. Terminal—not used with standard wiring
13. Regulator—2 red, green wires
14. Tail- and stoplight—green, red wires
15. Battery positive terminal—red wire
16. Battery negative terminal—black wire
17. Oil pressure signal switch—green wire
18. Handlebar headlight switch—red with black tracer, black with red tracer, red with yellow tracer
19. Horn switch—black, green wires
20. Terminal—not used with standard wiring
21. Terminal—2 black wires with red tracer
22. Terminal—red wire, red with yellow tracer
23. Terminal—not used with standard wiring
24. Terminal—2 black wires
25. Terminal—Yellow wire
26. Ignition circuit breaker—black, yellow wires
27. Stoplight switch—black, red wires
28. Generator signal light—green, black wires
29. Terminal—not used with standard wiring
30. Terminal—not used with standard wiring
31. Terminal—not used with standard wiring
32. Generator (F) terminal—green wire
33. Generator (A) terminal—red and green wires
34. Ignition light switch—see terminals 1 through 5
35. Ignition coil front cylinder—yellow wire
36. Ignition coil rear cylinder—2 black wires
37. Terminal plate—see 10 and 20 through 24
38. Terminal box—see terminals 39 through 43
39. Terminal—3 red wires
40. Terminal—2 green wires
41. Terminal—3 black wires
42. Terminal—yellow, green wires
43. Terminal—2 red wires
45. Terminal plate top mounting screw (ground)
46. Junction terminal—black, green wires
47. Neutral indicator light—black, green wires
48. Neutral indicator switch—green wire
50. Oil signal light—black and green wires
51. Horn—red and green wires
52. Headlight—black, white, and yelow wires

WIRING DIAGRAM (RADIO-SPECIAL)

Wiring with radio equipment is unchanged except for regulator, generator, and battery connections.

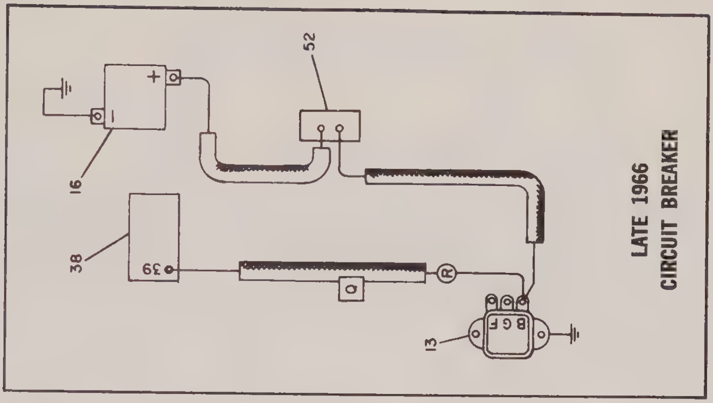
B. Conduit (1 wire)—green
G. Conduit (2 wire)—red and green
K. Conduit (1 wire)—red
L. Cable (2 wire)—red and green
M. Conduit (1 wire)—red (not shown)

13. Regulator—green and red wires
32. Generator (F) terminal—green wire
33. Generator (A) terminal—red wire
39. Terminal—red wire
49. Fuse

KEY TO COLOR CODE

R = Red
G = Green
B = Black
Y = Yellow
W = White
RB = Red with black tracer
BR = Black with red tracer
RY = Red with yellow tracer

1965-1967 ELECTRA-GLIDE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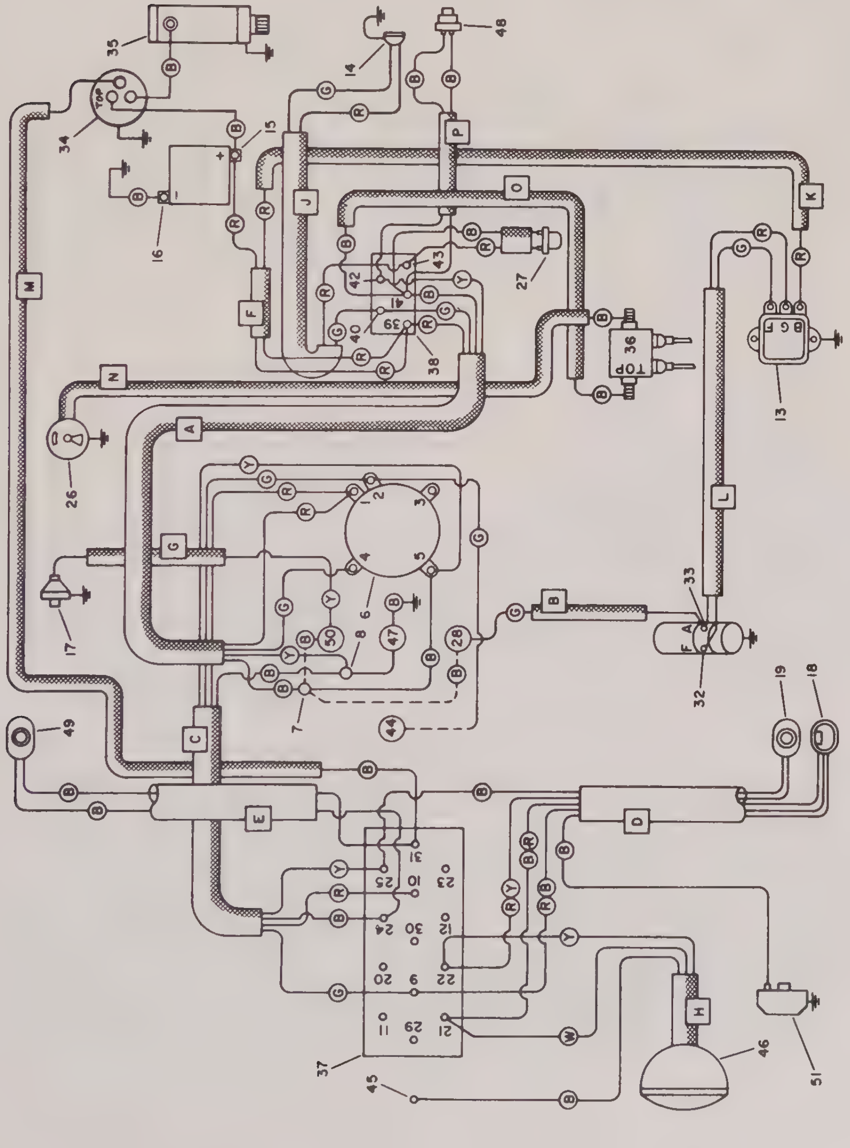
LATE 1966 CIRCUIT BREAKER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1965-1967 ELECTRA-GLIDE

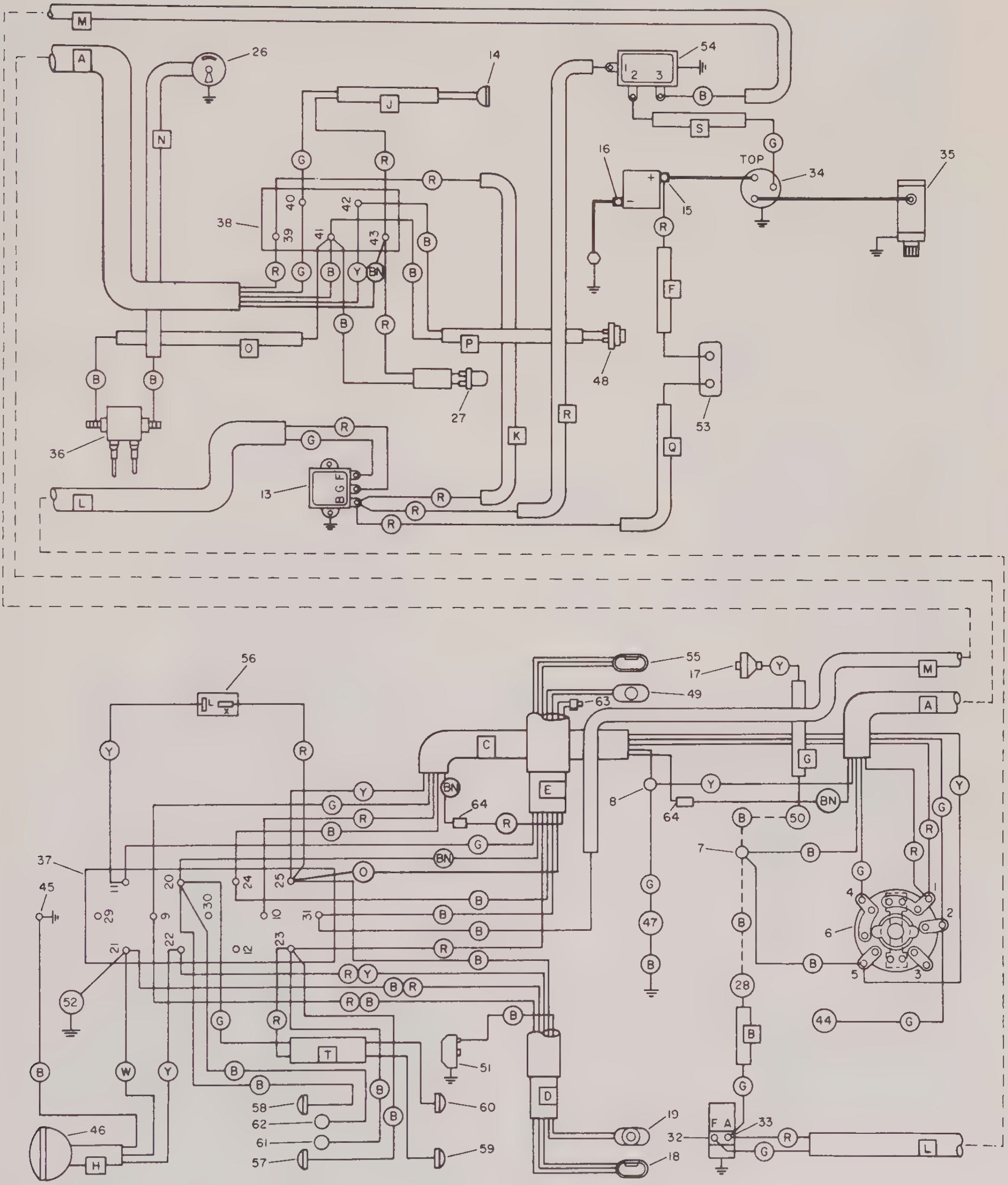
A. Conduit (4 wire)—red, green black, and yellow
B. Conduit (1 wire)—green
C. Conduit (4 wire)—red, green, yellow, and black
D. Left handlebar (loose wires)—red with black tracer, black with red tracer, red with yellow tracer, 2 black wires
E. Right handlebar (loose wires)—2 black wires
F. Conduit (2 wire)—2 red wires
G. Conduit (1 wire)—yellow
H. Conduit (3 wire)—black, white, and yellow
J. Conduit (2 wire)—red and green
K. Conduit (1 wire)—red
L. Conduit (2 wire)—green and red
M. Conduit (1 wire)—black
N. Conduit (1 wire)—black
O. Conduit (1 wire)—black
P. Conduit (2 wires)—2 black wires
Q. Conduit (1 wire)—red

1. Switch terminal—switch supply
2. Switch terminal—headlight
3. Switch terminal—not used with standard wiring
4. Switch terminal—taillight
5. Switch terminal—ignition coil
6. Ignition—light switch—see terminals 1 through 5
7. Junction terminal
8. Junction terminal
9. Terminal
10. Terminal
11. Terminal—not used with standard wiring
12. Terminal—not used with standard wiring
13. Regulator
14. Tail- and stoplight
15. Battery positive terminal
16. Battery negative terminal
17. Oil pressure signal switch
18. Handlebar headlight switch
19. Horn switch
20. Terminal—not used with standard wiring
21. Terminal
22. Terminal
23. Terminal—not used with standard wiring
24. Terminal
25. Terminal
26. Ignition circuit breaker
27. Stoplight switch
28. Generator signal light
29. Terminal—not used with standard wiring
30. Terminal—not used with standard wiring
31. Terminal
32. Generator (F) terminal
33. Generator (A) terminal
34. Starter solenoid
35. Starter motor
36. Ignition coil
37. Terminal plate
38. Terminal box—see terminals 39 through 43
39. Terminal
40. Terminal
41. Terminal
42. Terminal
43. Terminal
44. Speedometer light
45. Terminal plate top mounting screw (ground)
46. Headlight
47. Neutral indicator light
48. Neutral switch
49. Starter button
50. Oil signal light
51. Horn
52. Circuit breaker

KEY TO COLOR CODE

R = Red
G = Green
B = Black
Y = Yellow
W = White
RB = Red with black tracer
BR = Black with red tracer
RY = Red with yellow tracer

1968-1969 ELECTRA-GLIDE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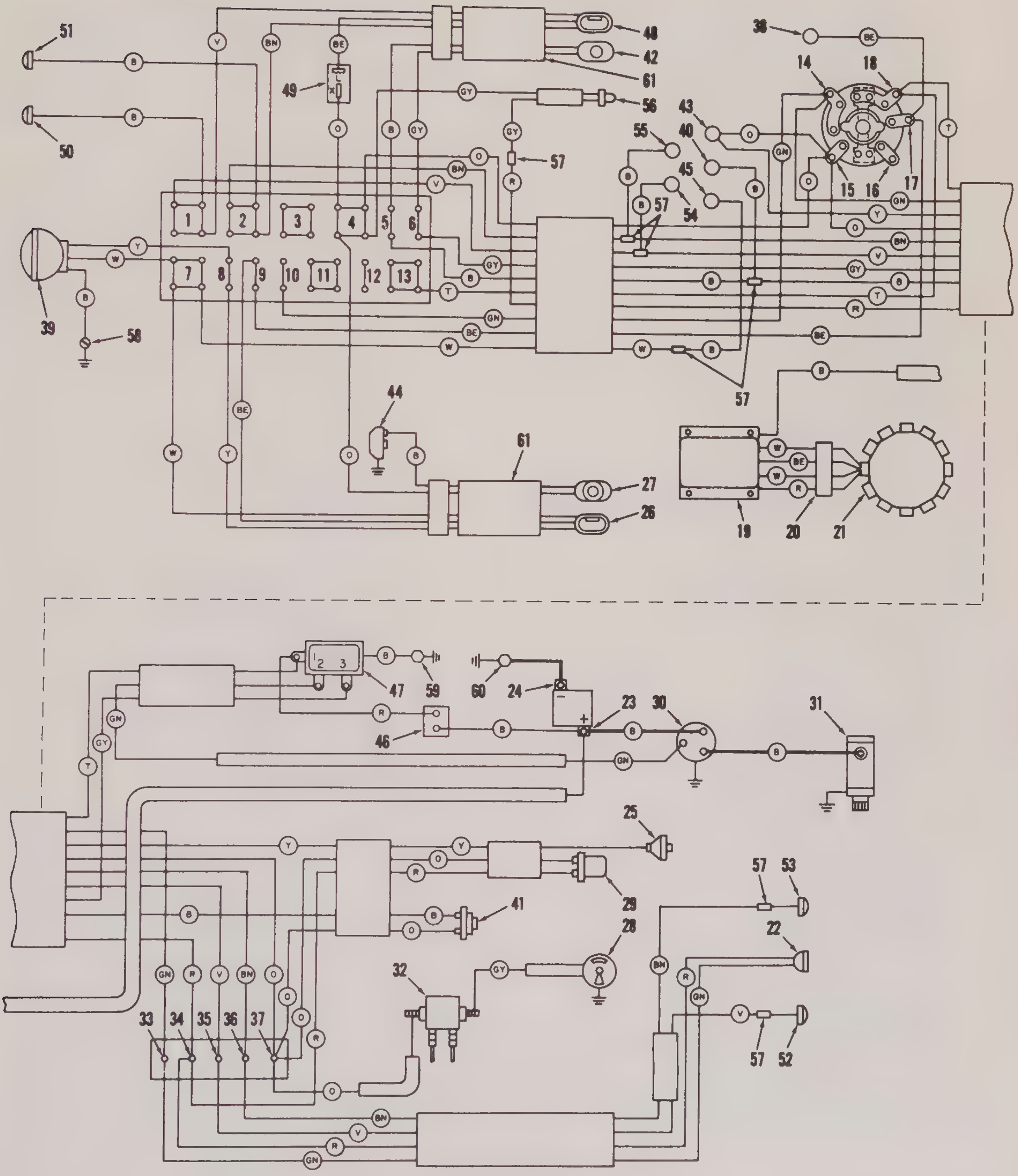
1968-1969 ELECTRA-GLIDE

A. Conduit (4 wire)—red, green, black, and yellow
B. Conduit (1 wire)—green
C. Conduit (4 wire)—red, green, yellow, and black
D. Left handlebar (loose wires)—red with black tracer, black with red tracer, red with yellow tracer, 2 black wires
E. Right handlebar (loose wires)—red, green, brown, 2 black wires
F. Conduit (1 wire)—red
G. Conduit (1 wire)—yellow
H. Conduit (3 wire)—black, white, and yellow
J. Conduit (2 wire)—red and green
K. Conduit (1 wire)—red
L. Conduit (2 wire)—green and red
M. Conduit (1 wire)—black
N. Conduit (1 wire)—black
O. Conduit (1 wire)—black
P. Conduit (2 wire)—2 black wires
Q. Conduit (1 wire)—red
R. Conduit (1 wire)—red
S. Conduit (1 wire)—green
T. Conduit (2 wire)—red and green
1. Switch terminal—switch supply
2. Switch terminal—headlight
3. Switch terminal—not used with standard wiring
4. Switch terminal—taillight
5. Switch terminal—ignition coil
6. Ignition—light switch—see terminals 1 through 5
7. Junction terminal
8. Junction terminal
9. Terminal
10. Terminal
11. Terminal
12. Terminal—not used with standard wiring
13. Regulator
14. Tail and stoplight
15. Battery positive terminal
16. Battery negative terminal
17. Oil pressure signal switch
18. Handlebar headlight switch
19. Horn switch
20. Terminal
21. Terminal
22. Terminal
23. Terminal
24. Terminal
25. Terminal
26. Ignition circuit breaker
27. Stoplight rear switch
28. Generator signal light
29. Terminal—not used with standard wiring
30. Terminal—not used with standard wiring
31. Terminal
32. Generator (F) terminal
33. Generator (A) terminal
34. Starter solenoid
35. Starter motor
36. Ignition coil
37. Terminal plate
38. Terminal box—see terminals 39 through 43
39. Terminal
40. Terminal
41. Terminal
42. Terminal
43. Terminal
44. Speedometer light
45. Terminal plate top mounting screw (ground)
46. Headlight
47. Neutral indicator light
48. Neutral switch
49. Starter button
50. Oil signal light
51. Horn
52. High beam indicator light
53. Overload circuit breaker
54. Starter relay
55. Direction signal switch
56. Direction signal flasher
57. Left front turn signal
58. Right front turn signal
59. Left rear turn signal
60. Right rear turn signal
61. Left turn signal pilot light
62. Right turn signal pilot light
63. Stoplight front switch
64. Connector

KEY TO COLOR CODE

B = Black
BN = Brown
G = Green
R = Red
W = White
Y = Yellow
O = Orange
BR = Black with red tracer
RB = Red with black tracer
RY = Red with yellow tracer

1970 ELECTRA-GLIDE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1970 ELECTRA-GLIDE

1. Front terminal board terminals
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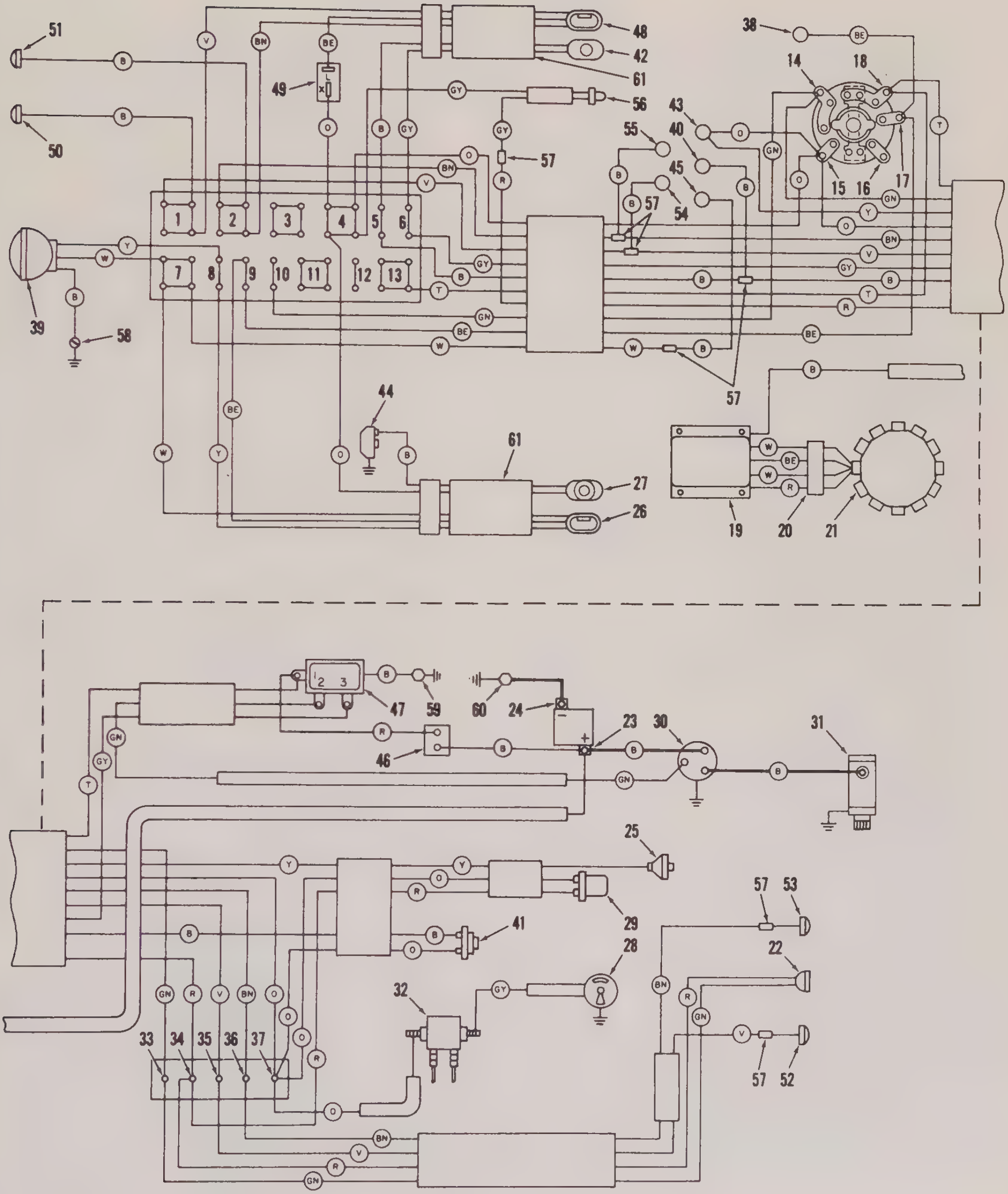
7. Front terminal board terminals
8. Front terminal board terminals
9. Front terminal board terminals
10. Front terminal board terminals
11. Front terminal board terminals
12. Front terminal board terminals
13. Front terminal board terminals
14. Taillight switch terminal
15. Ignition switch terminal
16. Switch terminal (not used with standard wiring)
17. Headlight switch terminal
18. Supply switch terminal
19. Regulator-rectifier module
20. Alternator to module connector plug
21. Alternator stator
22. Tail- and stoplight
23. Battery positive terminal
24. Battery negative terminal
25. Oil pressure signal switch
26. Handlebar headlight switch
27. Horn switch
28. Ignition circuit breaker
29. Stoplight switch—rear
30. Starter solenoid
31. Starter motor
32. Ignition coil
33. Rear terminal board terminal—top
34. Rear terminal board terminal
35. Rear terminal board terminal
36. Rear terminal board terminal
37. Rear terminal board terminal—bottom
38. Speedometer light
39. Headlight
40. Neutral indicator light
41. Neutral switch
42. Starter button
43. Oil signal light
44. Horn
45. High beam indicator light
46. Overload circuit breaker
47. Starter relay
48. Direction signal switch
49. Direction signal flasher
50. Left front turn signal
51. Right front turn signal
52. Left rear turn signal
53. Right rear turn signal
54. Left turn signal pilot light
55. Right turn signal pilot light
56. Stoplight switch—front
57. Connector
58. Terminal board mounting screw
60. Frame lug bolt
61. Handlebar

KEY TO COLOR CODE

B = Black
BN = Brown
G = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan

1971 ELECTRA-GLIDE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1971 ELECTRA-GLIDE

1. Front terminal board terminals
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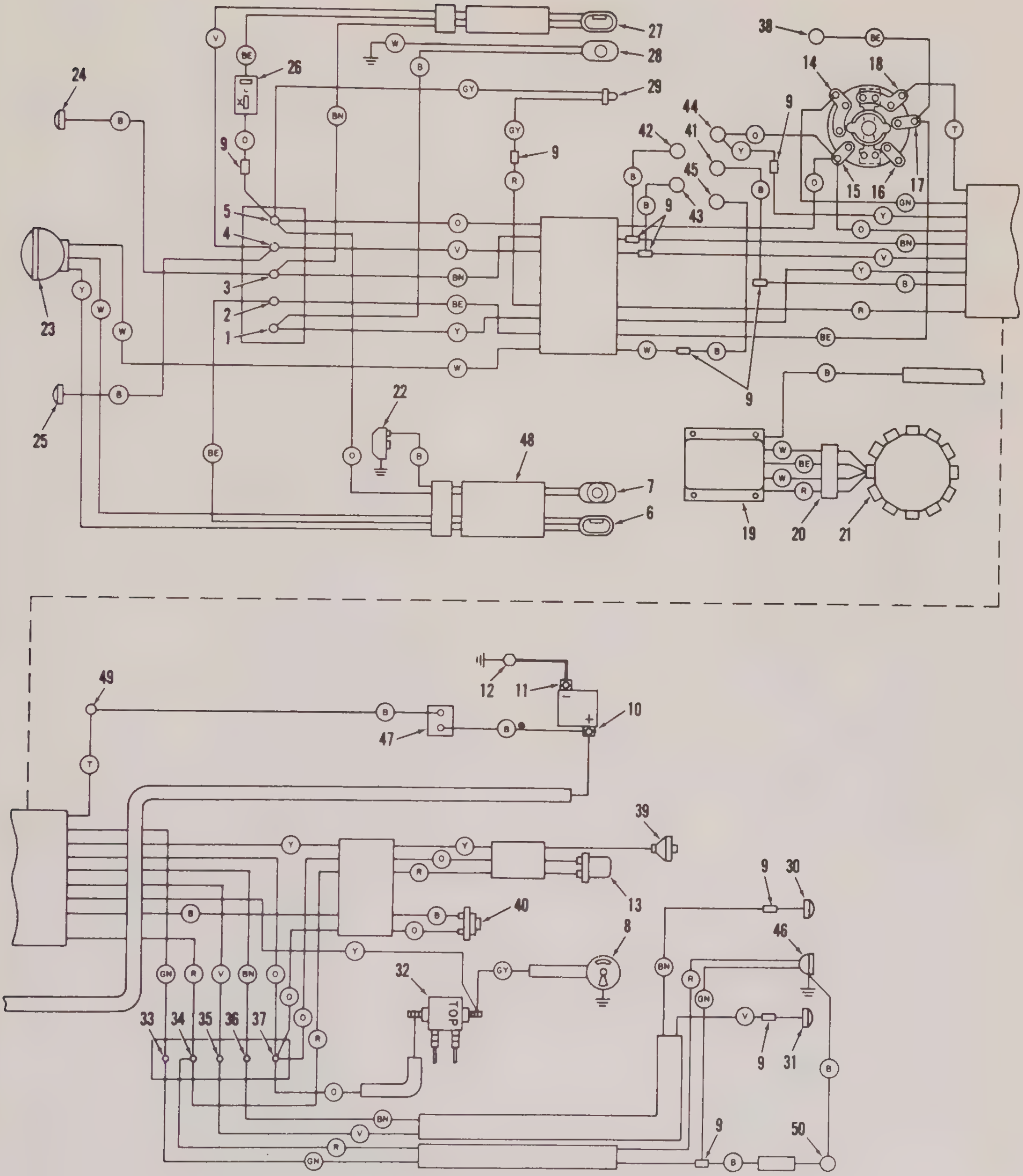
13. Front terminal board terminals
14. Taillight switch terminal
15. Ignition switch terminal
16. Switch terminal (not used with standard wiring)
17. Headlight switch terminal
18. Supply switch terminal
19. Regulator-rectifier module
20. Alternator to module connector plug
21. Alternator stator
22. Tail- and stoplight
23. Battery positive terminal
24. Battery negative terminal
25. Oil pressure signal switch
26. Handlebar headlight switch
27. Horn switch
28. Ignition circuit breaker
29. Stoplight switch—rear
30. Starter solenoid
31. Starter motor
32. Ignition coil
33. Rear terminal board terminal—top
34. Rear terminal board terminal
35. Rear terminal board terminal
36. Rear terminal board terminal
37. Rear terminal board terminal—bottom
38. Speedometer light
39. Headlight
40. Neutral indicator light
41. Neutral switch
42. Starter button
43. Oil signal light
44. Horn
45. High beam indicator light
46. Overload circuit breaker
47. Starter relay
48. Direction signal switch
49. Direction signal flasher
50. Left front turn signal
51. Right front turn signal
52. Left rear turn signal
53. Right rear turn signal
54. Left turn signal pilot light
55. Right turn signal pilot light
56. Stoplight switch—front
57. Connector
58. Terminal board mounting screw
59. Transmission stud
60. Frame lug bolt
61. Handlebar

KEY TO COLOR CODE

B = Black
BN = Brown
G = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan

1971 SUPER GLIDE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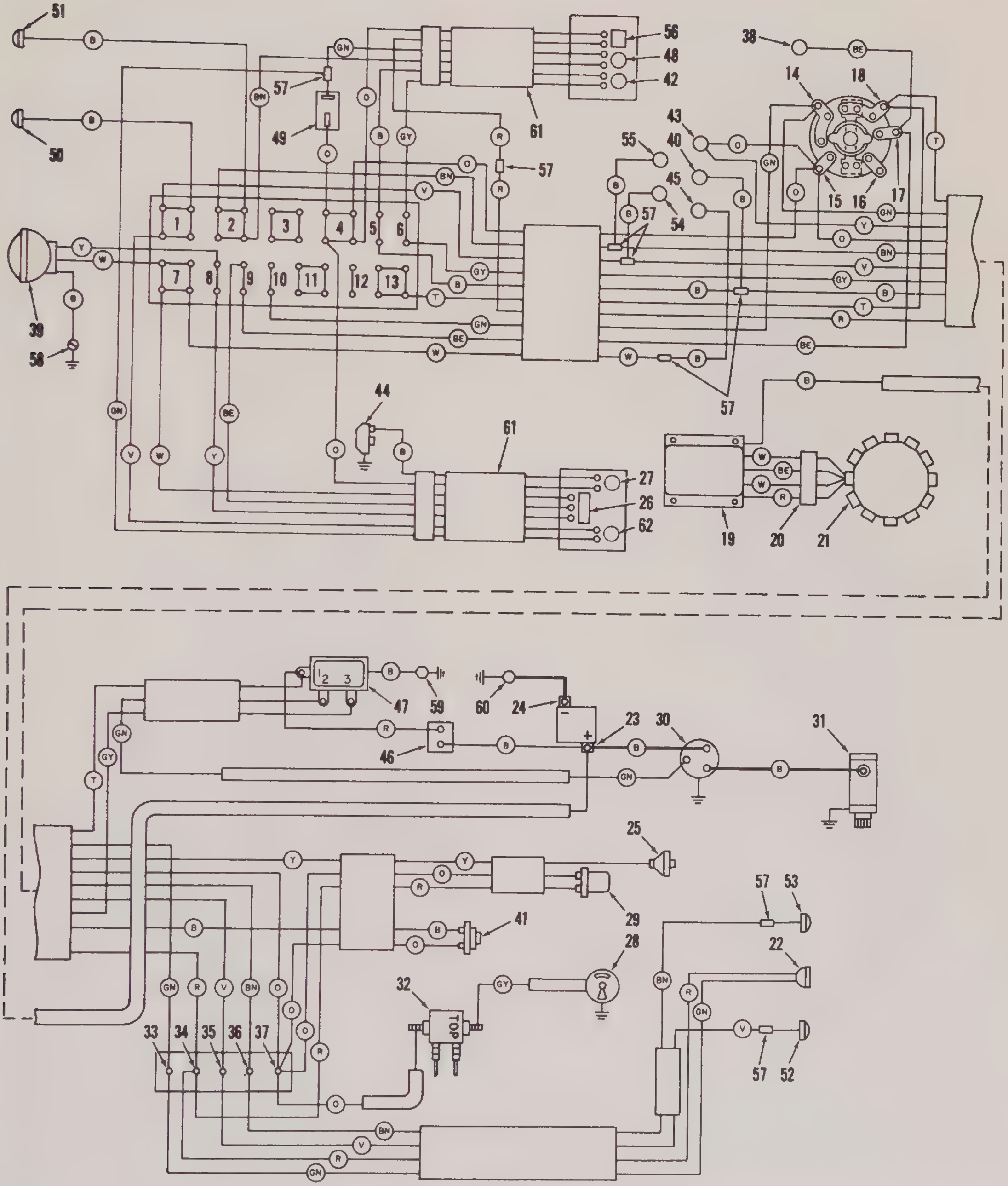
1971 SUPER GLIDE

1. Fork terminal board terminals
2. Fork terminal board terminals
3. Fork terminal board terminals
4. Fork terminal board terminals
5. Fork terminal board terminals
6. Headlight dimmer switch
7. Horn switch
8. Ignition circuit breaker
9. Wire connector
10. Battery positive terminal
11. Battery negative terminal
12. Frame lug bolt
13. Stoplight switch—rear
14. Taillight switch terminal
15. Ignition switch terminal
16. Switch terminal (not used with standard wiring)
17. Headlight switch terminal
18. Supply switch terminal
19. Regulator-rectifier module
20. Alternator to module connector plug
21. Alternator stator
22. Horn
23. Headlight
24. Right front turn signal
25. Left front turn signal
26. Direction signal flasher
27. Direction signal switch
28. Ignition cutout button
29. Stoplight switch—front
30. Right rear turn signal light
31. Left rear turn signal light
32. Ignition coil
33. Rear terminal board terminal—top
34. Rear terminal board terminal
35. Rear terminal board terminal
36. Rear terminal board terminal
37. Rear terminal board terminal—bottom
38. Speedometer light
39. Oil pressure signal switch
40. Neutral switch
41. Neutral indicator light
42. Right turn signal pilot light
43. Left turn signal pilot light
44. Oil signal light
45. High beam indicator light
46. Tail- and stoplight
47. Overload circuit breaker
48. Left handlebar
49. Junction terminal
50. License plate light

KEY TO COLOR CODE

B = Black
BN = Brown
GN = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan

1972 ELECTRA-GLIDE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1972 ELECTRA-GLIDE

1. Front terminal board terminal
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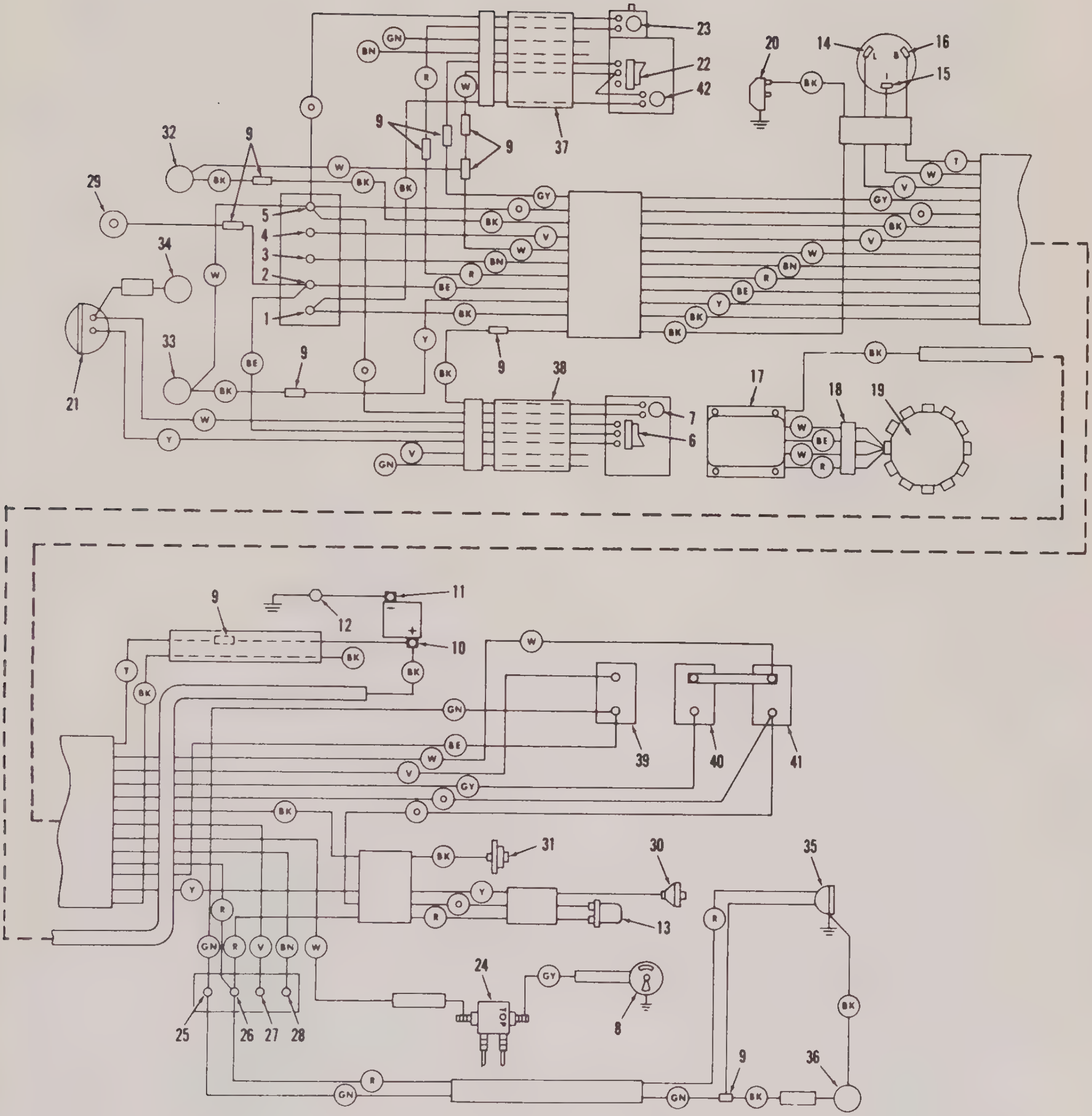
7. Front terminal board terminal.
8. Front terminal board terminal
9. Front terminal board terminal
10. Front terminal board terminal
11. Front terminal board terminal
12. Front terminal board terminal
13. Front terminal board terminal
14. Taillight switch terminal
15. Ignition switch terminal
16. Switch terminal (not used with standard wiring)
17. Headlight switch terminal
18. Supply switch terminal
19. Regulator-rectifier module
20. Alternator to module connector plug
21. Alternator stator
22. Tail- and stoplight
23. Battery positive terminal
24. Battery negative terminal
25. Oil pressure signal switch
26. Handlebar headlight switch
27. Horn switch
28. Ignition circuit breaker
29. Stoplight switch—rear
30. Starter solenoid
31. Starter motor
32. Ignition coil
33. Rear terminal board terminal—top
34. Rear terminal board terminal
35. Rear terminal board terminal
36. Rear terminal board terminal
37. Rear terminal board terminal—bottom
38. Speedometer light
39. Headlight
40. Neutral indicator light
41. Neutral switch
42. Starter button
43. Oil signal light
44. Horn
45. High beam indicator light
46. Overload circuit breaker
47. Starter relay
48. Right turn signal switch
49. Direction signal flasher
50. Left front turn signal
51. Right front turn signal
52. Left rear turn signal
53. Right rear turn signal
54. Left turn signal pilot light
55. Right turn signal pilot light
56. Stoplight switch—front
57. Connector
58. Terminal board mounting screw
59. Transmission stud
60. Frame lug bolt
61. Handlebar
62. Left turn signal switch

KEY TO COLOR CODE

B = Black
BN = Brown
GN = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan

1973 FX 1200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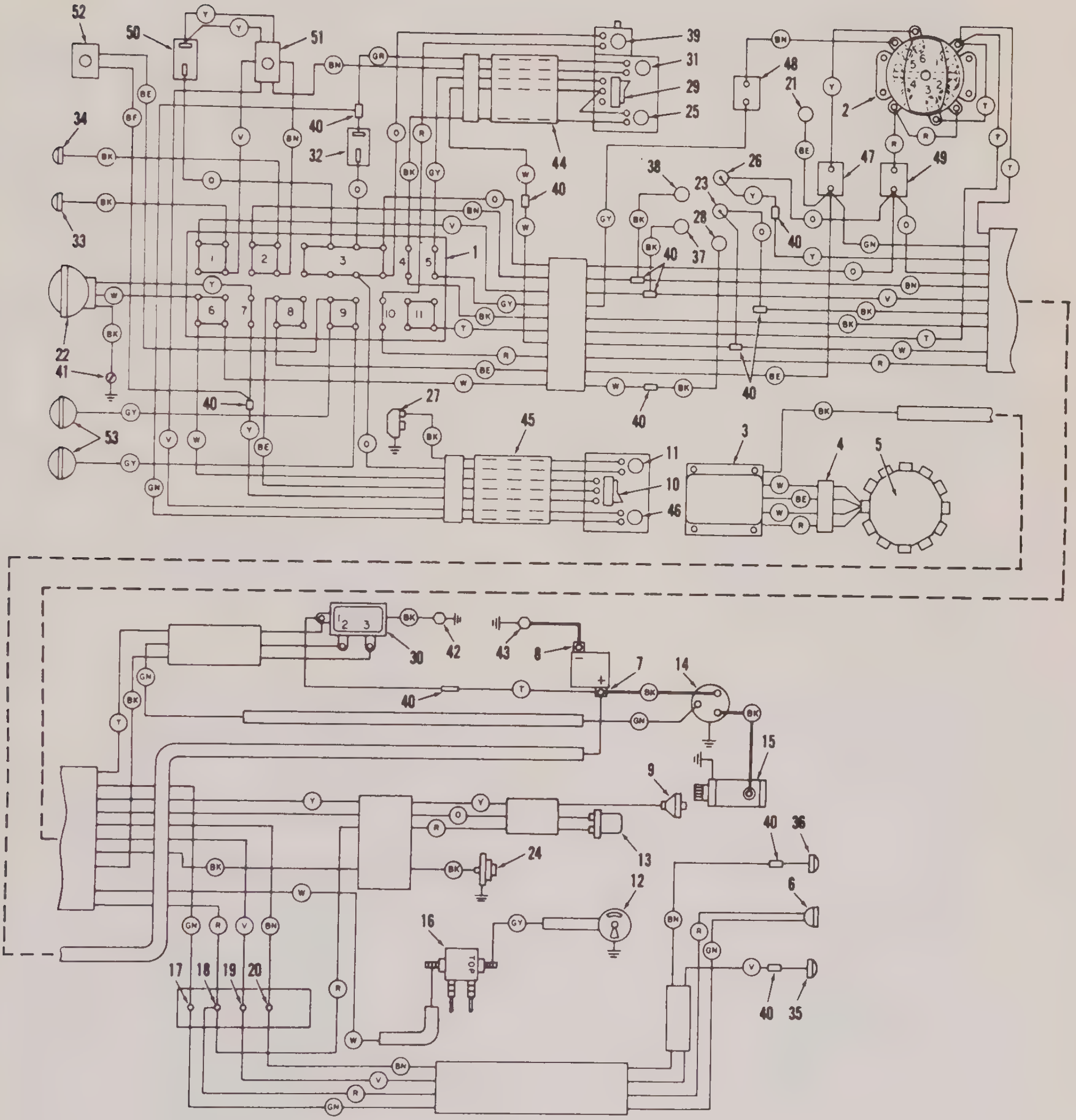
1973 FX 1200

1. Fork terminal board terminal
2. Fork terminal board terminal
3. Fork terminal board terminal
4. Fork terminal board terminal
5. Fork terminal board terminal
6. Headlight beam switch
7. Horn switch
8. Ignition breaker (timer)
9. Wire connector
10. Battery positive terminal
11. Battery negative terminal
12. Frame lug bolt
13. Stoplight switch—rear
14. Lights (L) switch terminal
15. Ignition (I) switch terminal
16. Battery (B) switch terminal
17. Regulator-rectifier module
18. Alternator to module connector plug
19. Alternator stator
20. Horn
21. Headlight
22. Engine stop switch
23. Stoplight switch—front
24. Ignition coil
25. Rear terminal board terminal—top
26. Rear terminal board terminal
27. Rear terminal board terminal
28. Rear terminal board terminal—bottom
29. Speedometer light
30. Oil pressure signal switch
31. Neutral switch
32. Neutral indicator light
33. Oil signal light
34. High beam indicator light
35. Tail- and stoplight
36. License plate light
37. Right handlebar
38. Left handlebar
39. Lighting circuit breaker
40. Ignition circuit breaker
41. Accessories circuit breaker
42. Switch

KEY TO COLOR CODE

BK = Black
BN = Brown
GN = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan

1973-1974 FL/FLH 1200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1973-1974 FL/FLH 1200

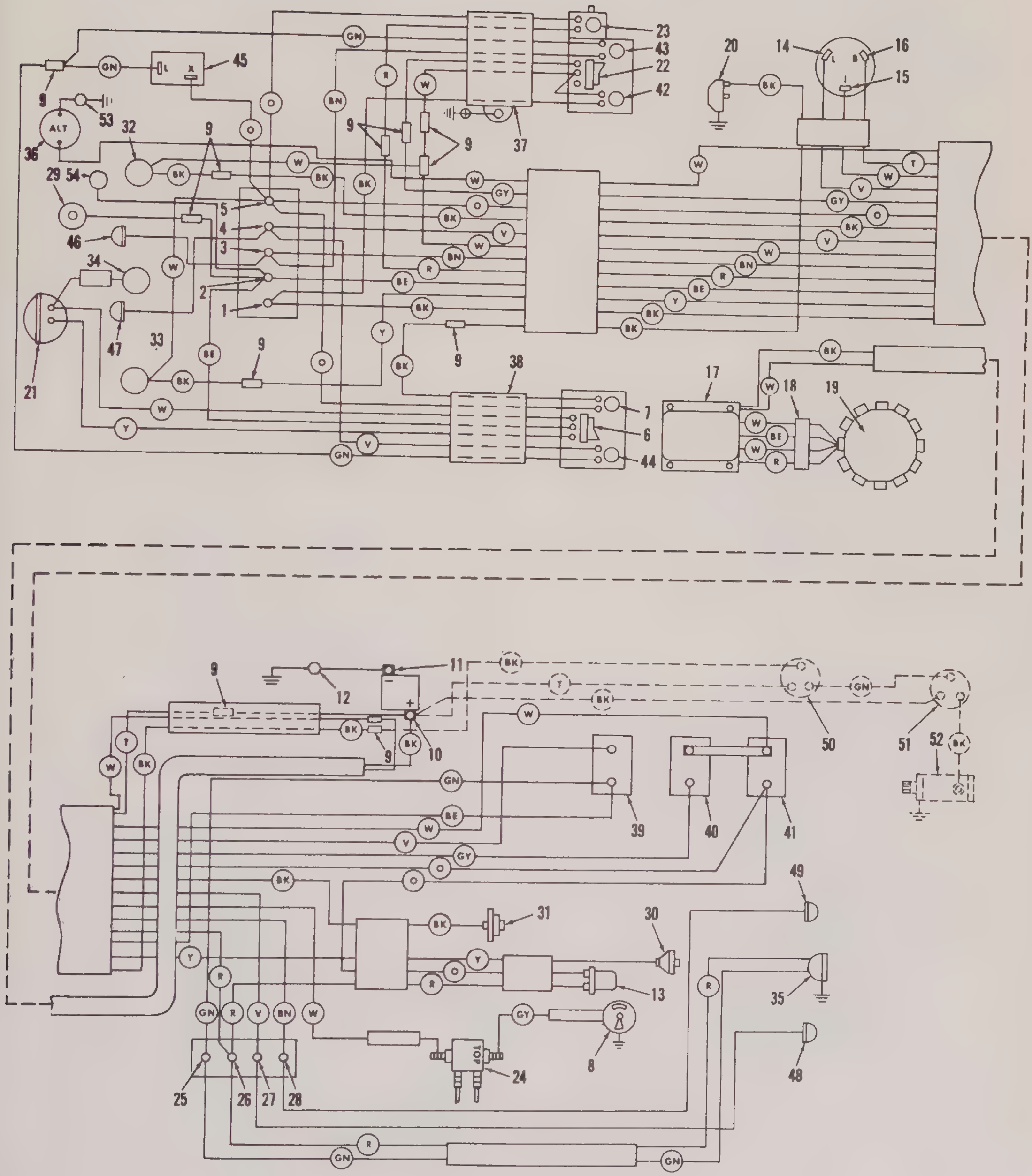
1. Front terminal board terminals (1 to 11)
2. Switch terminals (1 to 6)
3. Regulator-rectifier module
4. Alternator to module connector plug
5. Alternator stator
6. Tail- and stoplight
7. Battery positive terminal
8. Battery negative terminal
9. Oil pressure signal switch
10. Headlight beam switch
11. Horn switch
12. Ignition breaker (timer)
13. Stoplight switch—rear
14. Starter solenoid
15. Starter motor
16. Ignition coil
17. Rear terminal board terminal—top
18. Rear terminal board terminal
19. Rear terminal board terminal
20. Rear terminal board terminal—bottom
21. Speedometer light
22. Headlight
23. Neutral indicator light
24. Neutral switch
25. Starter button
26. Oil signal light
27. Horn
28. High beam indicator light
29. Engine stop switch
30. Starter relay
31. Right turn signal switch
32. Direction signal flasher
33. Left front turn signal
34. Right front turn signal
35. Left rear turn signal
36. Right rear turn signal
37. Left turn signal pilot light
38. Right turn signal pilot light
39. Stoplight switch—front
40. Connector
41. Terminal board mounting screw
42. Transmission stud
43. Frame lug bolt
44. Right handlebar
45. Left handlebar
46. Left turn signal switch
47. Lighting circuit breaker
48. Ignition circuit breaker
49. Accessories circuit breaker
50. Emergency flasher
51. Emergency flasher switch
52. Passing light switch
53. Passing light

SWITCH CONNECTIONS	
POSITION	CONTACTS
Accessory	1-4
Off	—
Ignition and accessory	1-2-5
Ignition, light and accessory	2-3-5-6

KEY TO COLOR CODE

BK = Black
BN = Brown
GN = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan

1974 FX/FXE 1200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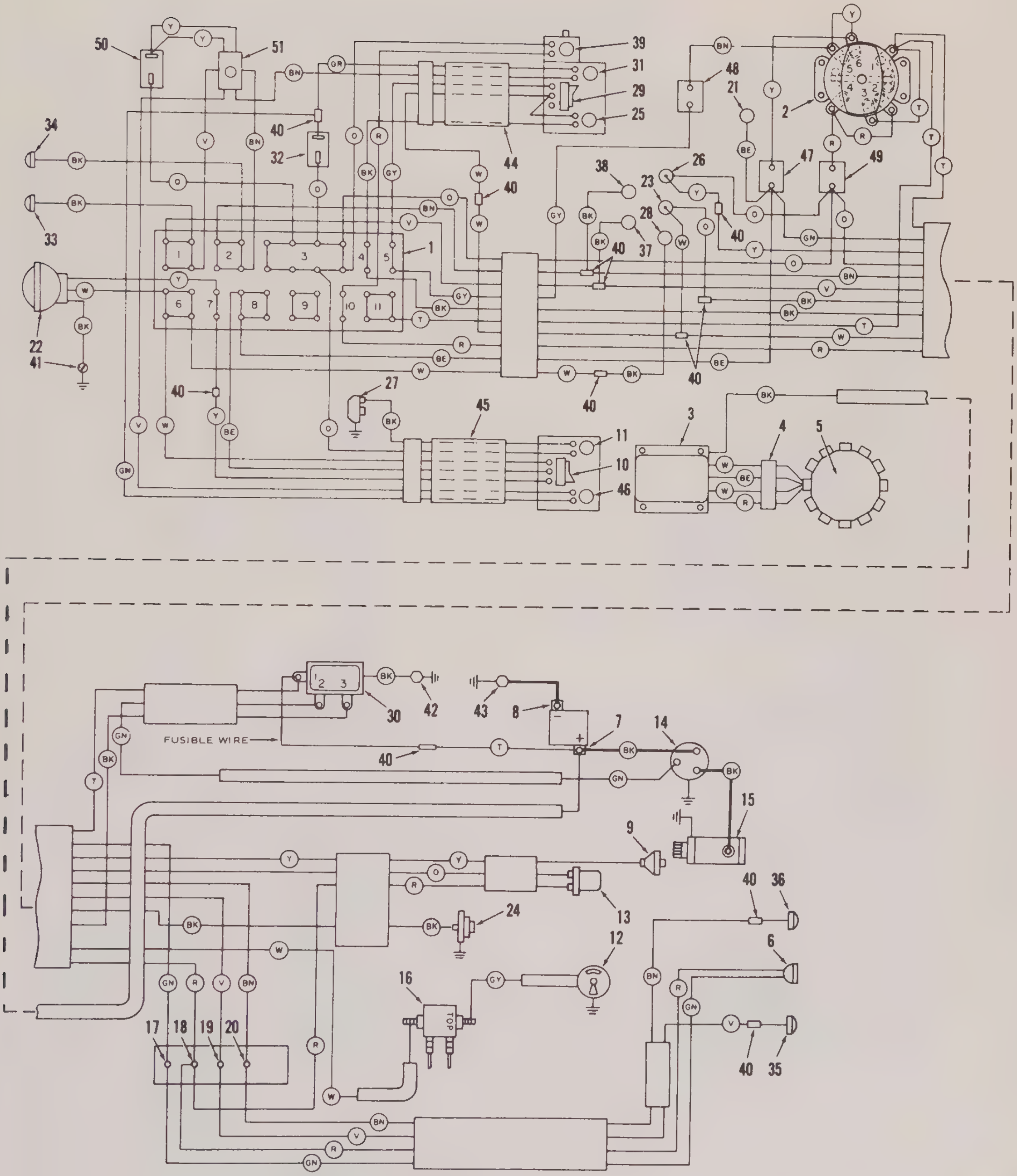
1974 FX/FXE 1200

1. Fork terminal board terminal
2. Fork terminal board terminal
3. Fork terminal board terminal
4. Fork terminal board terminal
5. Fork terminal board terminal
6. Headlight beam switch
7. Horn switch
8. Ignition breaker (timer)
9. Wire connector
10. Battery positive terminal
11. Battery negative terminal
12. Frame lug bolt
13. Stoplight switch—rear
14. Lights (L) switch terminal
15. Ignition (I) switch terminal
16. Battery (B) switch terminal
17. Regulator-rectifier module
18. Alternator to module connector plug
19. Alternator stator
20. Horn
21. Headlight
22. Engine stop switch
23. Stoplight switch—front
24. Ignition coil
25. Rear terminal board terminal—top
26. Rear terminal board terminal
27. Rear terminal board terminal
28. Rear terminal board terminal—bottom
29. Speedometer light
30. Oil pressure signal switch
31. Neutral switch
32. Neutral indicator light
33. Oil signal light
34. High beam indicator light
35. Tail- and stoplight
36. Tachometer
37. Right handlebar
38. Left handlebar
39. Lighting circuit breaker
40. Ignition circuit breaker
41. Accessories circuit breaker
42. Switch
43. Right turn signal switch
44. Left turn signal switch
45. Direction signal flasher
46. Left front turn signal
47. Right front turn signal
48. Left rear turn signal
49. Right rear turn signal
50. Starter relay (FXE only)
51. Starter solenoid (FXE only)
52. Starter motor (FXE only)
53. Handlebar pinch bolt
54. Tachometer light

KEY TO COLOR CODE

BK = Black
BN = Brown
GN = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan
PK = Pink

1975 FL/FLH 1200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1975 FL/FLH 1200

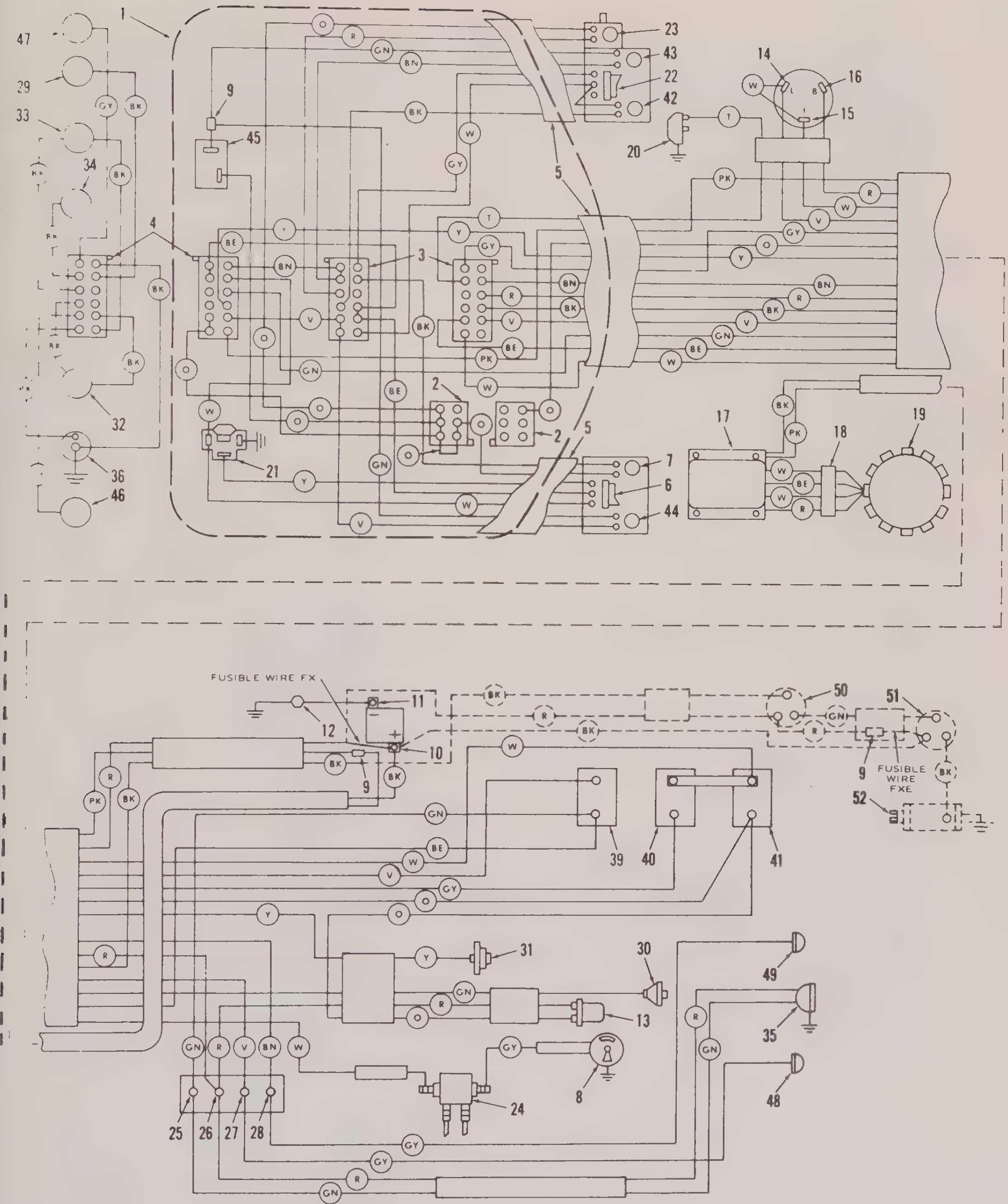
1. Front terminal board (terminals 1 to 11)
2. Switch (terminals 1 to 6)
3. Regulator-rectifier module
4. Alternator to module connector plug
5. Alternator stator
6. Tail/stoplight
7. Battery positive terminal
8. Battery negative terminal
9. Oil pressure signal switch
10. Headlight beam switch
11. Horn switch
12. Ignition breaker (timer)
13. Stoplight switch—rear
14. Starter solenoid
15. Starter motor
16. Ignition coil
17. Rear terminal board terminal—top
18. Rear terminal board terminal
19. Rear terminal board terminal
20. Rear terminal board terminal—bottom
21. Speedometer light
22. Headlight
23. Neutral indicator light
24. Neutral switch
25. Starter button
26. Oil signal light
27. Horn
28. High beam indicator light
29. Engine stop switch
30. Starter relay
31. Right turn signal switch
32. Direction signal flasher
33. Left front turn signal light
34. Right front turn signal light
35. Left rear turn signal light
36. Right rear turn signal light
37. Left turn signal pilot light
38. Right turn signal pilot light
39. Stoplight switch—front
40. Connector
41. Terminal board mounting screw
42. Transmission stud
43. Frame lug bolt
44. Right handlebar
45. Left handlebar
46. Left turn signal switch
47. Lighting circuit breaker
48. Ignition circuit breaker
49. Accessories circuit breaker
50. Emergency flasher
51. Emergency flasher switch

SWITCH CONNECTIONS	
POSITION	CONTACTS
Accessory	1-4
Off	—
Ignition, light, and accessory	2-4-5-6
Ignition, light, and accessory	2-3-4-5-6

KEY TO COLOR CODE

BK = Black
BN = Brown
GN = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan

1975 FX/FXE 1200



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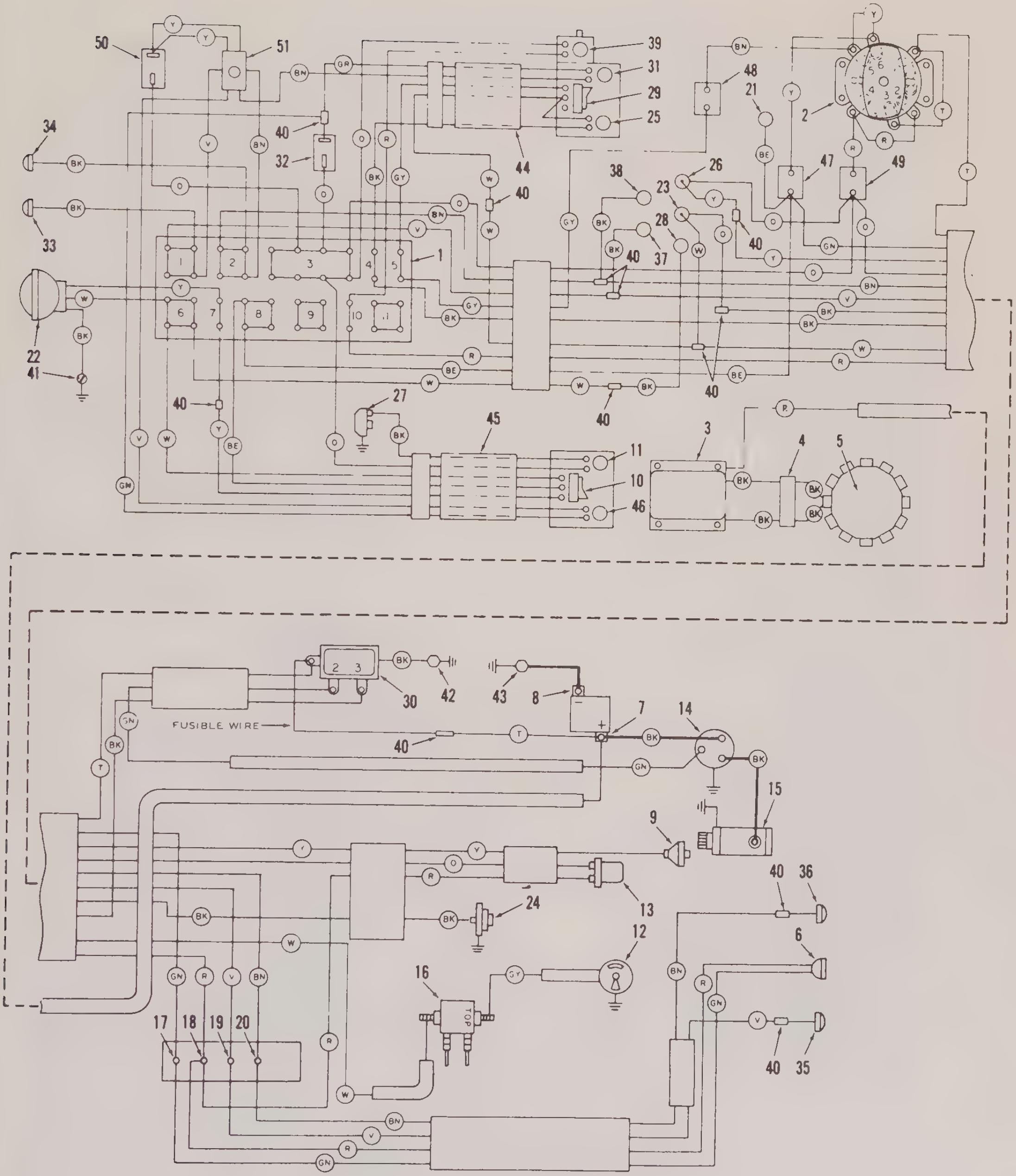
1975 FX/FXE 1200

1. Headlight housing
2. Socket-plug combination
3. Socket-plug combination
4. Socket-plug combination
5. Wiring harness
6. Headlight beam switch
7. Horn switch
8. Ignition breaker (timer)
9. Wire connector
10. Battery positive terminal
11. Battery negative terminal
12. Frame lug bolt
13. Stoplight switch—rear
14. Switch "L" lights terminal
15. Switch "I" ignition terminal
16. Switch "B" battery terminal
17. Regulator-rectifier module
18. Alternator to module connector plug
19. Alternator stator
20. Horn
21. Headlight socket
22. Engine stop switch
23. Stoplight switch—front
24. Ignition coil
25. Rear terminal board terminal—top
26. Rear terminal board terminal
27. Rear terminal board terminal
28. Rear terminal board terminal—bottom
29. Speedometer light
30. Oil pressure signal switch
31. Neutral switch
32. Neutral indicator light
33. Oil signal light
34. High beam indicator light
35. Tail/stoplight
36. Tachometer
39. Lighting circuit breaker
40. Ignition circuit breaker
41. Accessories circuit breaker
42. Starter switch
43. Right turn signal switch
44. Left turn signal switch
45. Direction signal flasher
46. Left front turn signal light
47. Right front turn signal light
48. Left rear turn signal light
49. Right rear turn signal light
50. Starter relay (FXE only)
51. Starter solenoid (FXE only)
52. Starter motor (FXE only)

KEY TO COLOR CODE

BK = Black
BN = Brown
GN = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan
PK = Pink

1976-1977 FL/FLH 1200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1976-1977 FL/FLH 1200

1. Front terminal board (terminals 1 to 11)
2. Switch (terminals 1 to 6)
3. Regulator-rectifier module
4. Alternator to module connector plug
5. Alternator stator
6. Tail/stoplight
7. Battery positive terminal
8. Battery negative terminal
9. Oil pressure signal switch
10. Headlight beam switch
11. Horn switch
12. Ignition breaker (timer)
13. Stoplight switch—rear
14. Starter solenoid
15. Starter motor
16. Ignition coil
17. Rear terminal board terminal—top
18. Rear terminal board terminal
19. Rear terminal board terminal
20. Rear terminal board terminal—bottom
21. Speedometer light
22. Headlight
23. Neutral indicator light
24. Neutral switch
25. Starter button
26. Oil signal light
27. Horn
28. High beam indicator light
29. Engine stop switch
30. Starter relay
31. Right turn signal switch
32. Direction signal flasher
33. Left front turn signal light
34. Right front turn signal light
35. Left rear turn signal light
36. Right rear turn signal light
37. Left turn signal pilot light
38. Right turn signal pilot light
39. Stoplight switch—front
40. Connector
41. Terminal board mounting screw
42. Transmission stud
43. Frame lug bolt
44. Right handlebar
45. Left handlebar
46. Left turn signal switch
47. Lighting circuit breaker
48. Ignition circuit breaker
49. Accessories circuit breaker
50. Emergency flasher
51. Emergency flasher switch

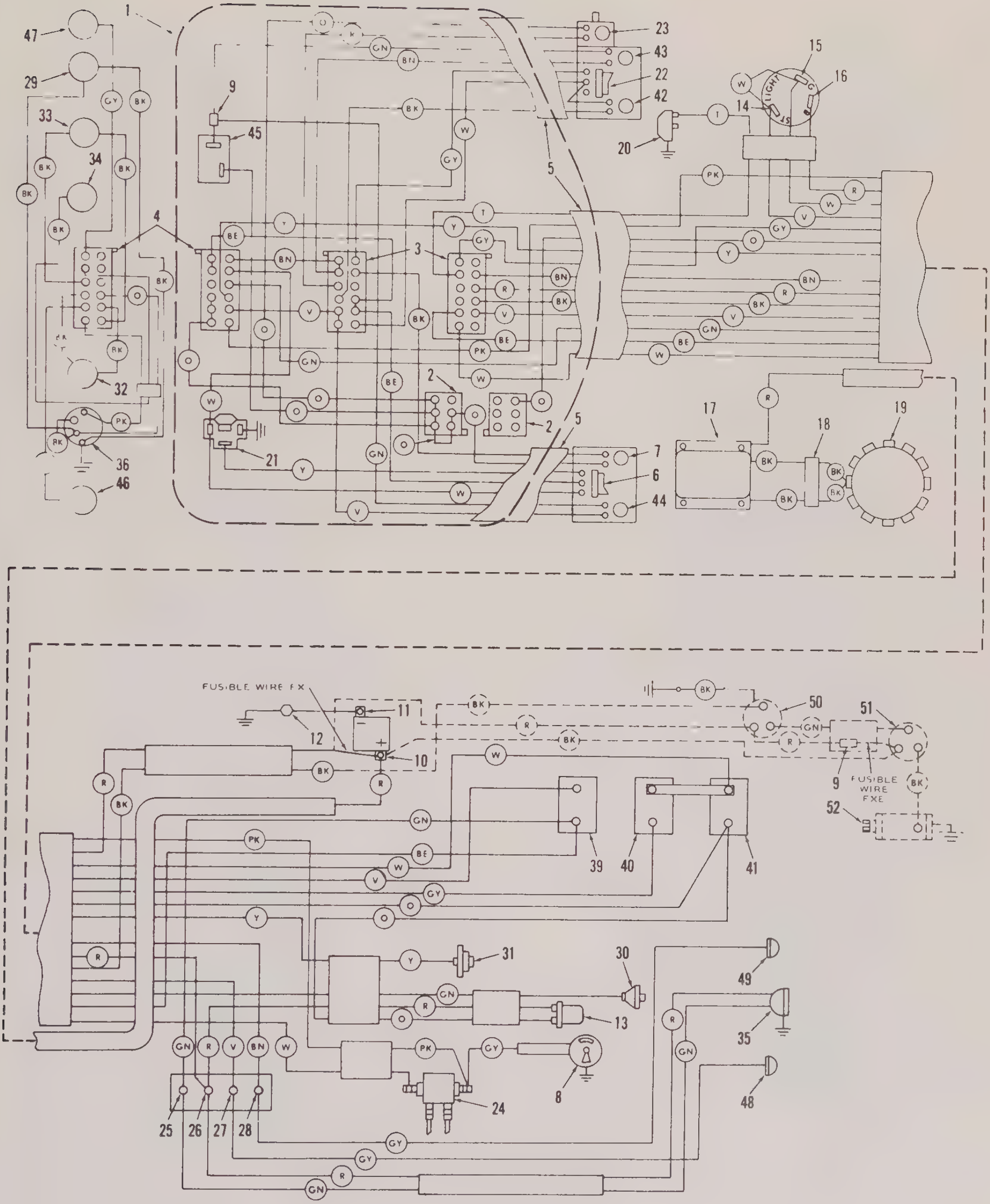
SWITCH CONNECTIONS

POSITION	CONTACTS
Accessory	1-4
Off	—
Ignition, light, and accessory	2-4-5-6
Ignition, light, and accessory	2-3-4-5-6

KEY TO COLOR CODE

BK = Black
BN = Brown
GN = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan

1976-1977 FX/FXE 1200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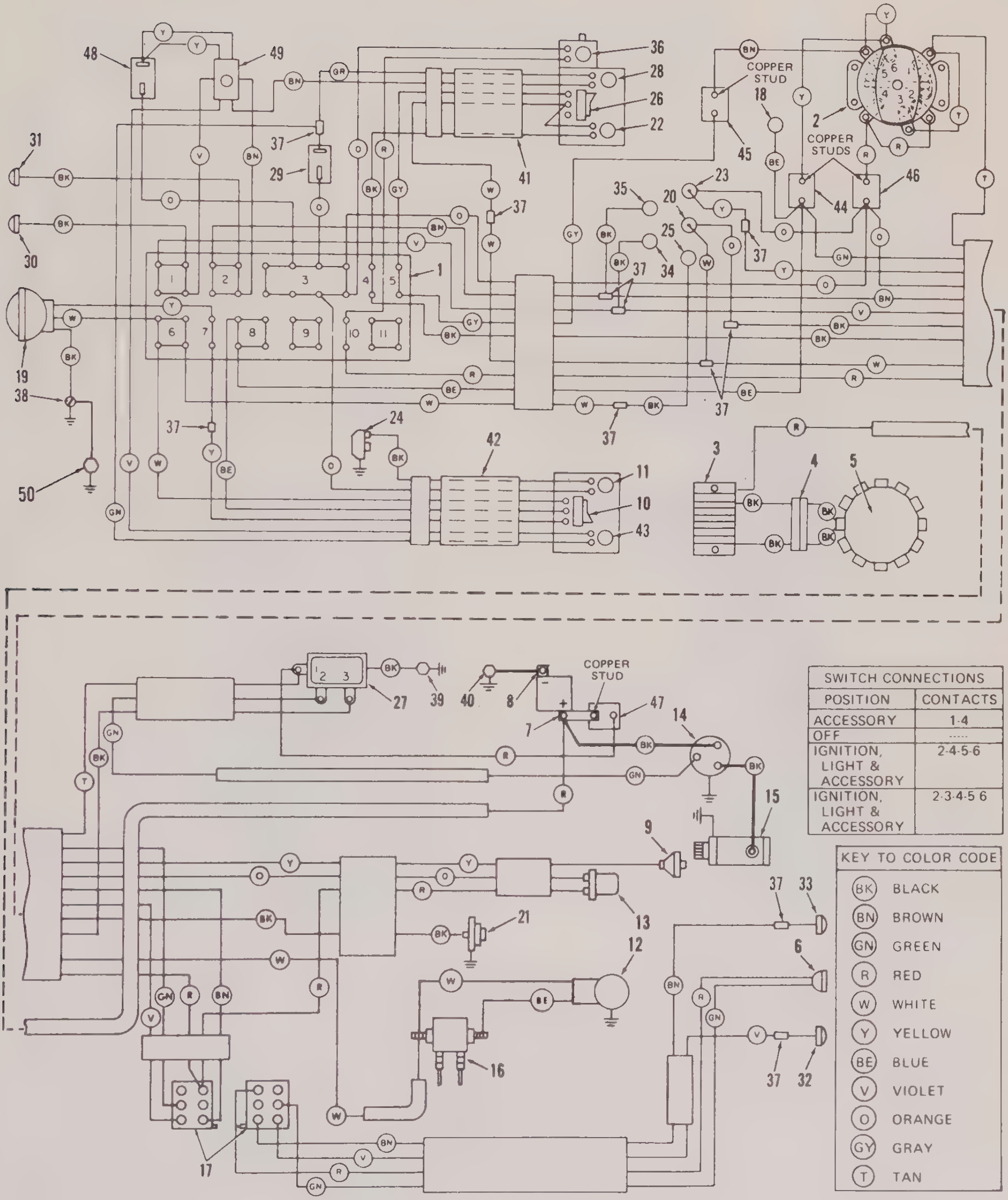
1976-1977 FX/FXE 1200

1. Headlight housing
2. Socket-plug combination
3. Socket-plug combination
4. Socket-plug combination
5. Wiring harness
6. Headlight beam switch
7. Horn switch
8. Ignition breaker (timer)
9. Wire connector
10. Battery positive terminal
11. Battery negative terminal
12. Frame lug bolt
13. Stoplight switch—rear
14. Switch "L" lights terminal
15. Switch "I" ignition terminal
16. Switch "B" battery terminal
17. Regulator-rectifier module
18. Alternator to module connector plug
19. Alternator stator
20. Horn
21. Headlight socket
22. Engine stop switch
23. Stoplight switch—front
24. Ignition coil
25. Rear terminal board terminal—top
26. Rear terminal board terminal
27. Rear terminal board terminal
28. Rear terminal board terminal—bottom
29. Speedometer light
30. Oil pressure signal switch
31. Neutral switch
32. Neutral indicator light
33. Oil signal light
34. High beam indicator light
35. Tail/stoplight
36. Tachometer
39. Lighting circuit breaker
40. Ignition circuit breaker
41. Accessories circuit breaker
42. Starter switch
43. Right turn signal switch
44. Left turn signal switch
45. Direction signal flasher
46. Left front turn signal light
47. Right front turn signal light
48. Left rear turn signal light
49. Right rear turn signal light
50. Starter relay (FXE only)
51. Starter solenoid (FXE only)
52. Starter motor (FXE only)

KEY TO COLOR CODE

BK = Black
BN = Brown
GN = Green
R = Red
W = White
Y = Yellow
BE = Blue
V = Violet
O = Orange
GY = Gray
T = Tan
PK = Pink

1978-1979 FL/FLH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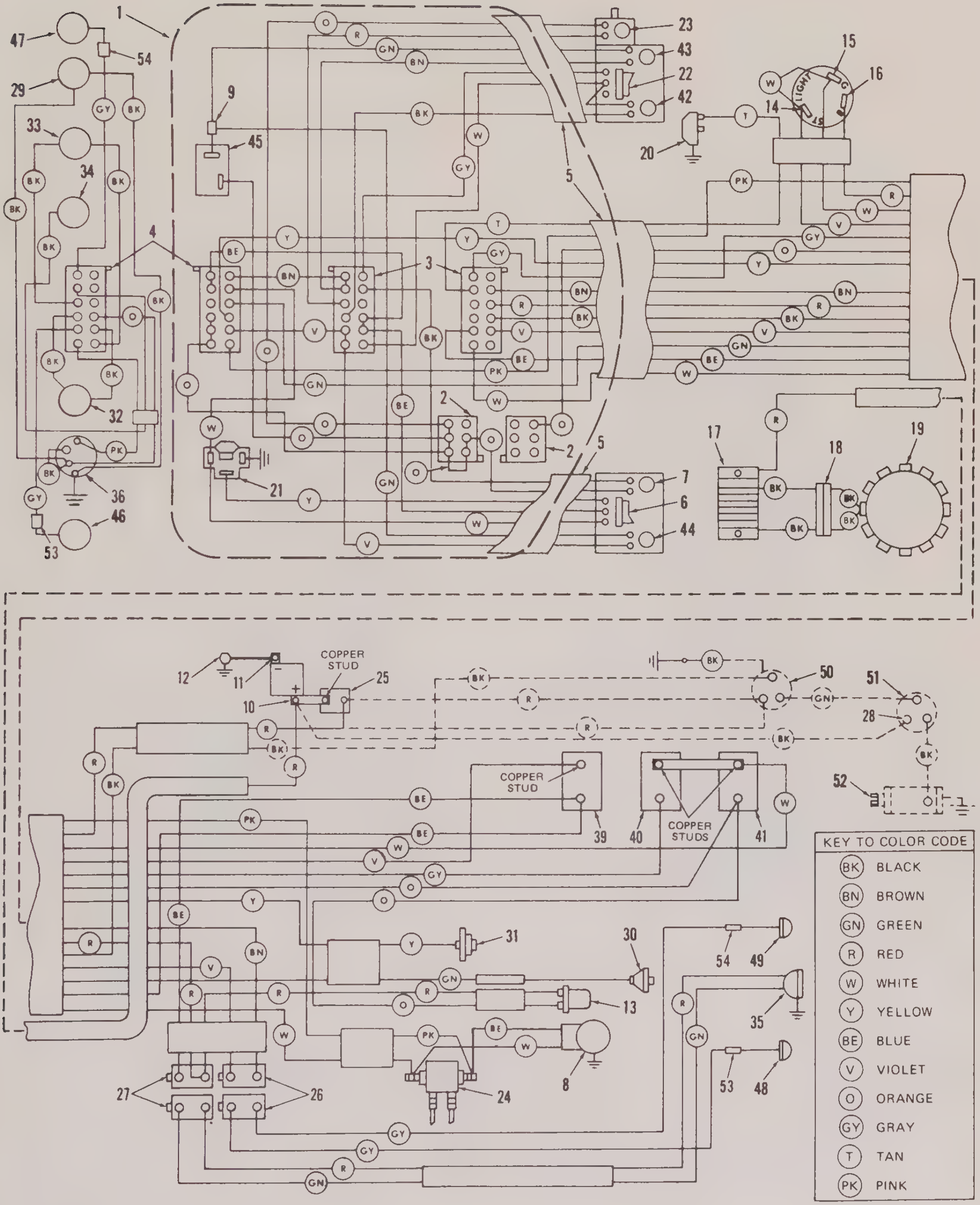
SWITCH CONNECTIONS	
POSITION	CONTACTS
ACCESSORY	1-4
OFF	-----
IGNITION, LIGHT & ACCESSORY	2-4-5-6
IGNITION, LIGHT & ACCESSORY	2-3-4-5 6

KEY TO COLOR CODE	
BK	BLACK
BN	BROWN
GN	GREEN
R	RED
W	WHITE
Y	YELLOW
BE	BLUE
V	VIOLET
O	ORANGE
GY	GRAY
T	TAN

1978-1979 FL/FLH

1. Front terminal board (terminals 1 to 11)
2. Switch (terminals 1 to 6)
3. Regulator-rectifier module
4. Alternator to module connector plug
5. Alternator stator
6. Tail and stoplight
7. Battery positive terminal
8. Battery negative terminal
9. Oil pressure signal switch
10. Headlamp beam switch
11. Horn switch
12. Ignition timer
13. Stoplight switch—rear
14. Starter solenoid
15. Starter motor
16. Ignition coil
17. Rear wiring harness connector
18. Speedometer light
19. Headlamp
20. Neutral indicator light
21. Neutral switch
22. Starter button
23. Oil signal light
24. Horn
25. High beam indicator lamp
26. Engine stop switch
27. Starter relay
28. Right turn signal switch
29. Turn signal flasher
30. Left front turn signal lamp
31. Right front turn signal lamp
32. Left rear turn signal lamp
33. Right rear turn signal lamp
34. Left turn signal pilot lamp
35. Right turn signal pilot lamp
36. Front stoplight switch
37. Connector (11)
38. Terminal board mounting screw
39. Transmission stud
40. Frame lug bolt
41. Right handlebar harness
42. Left handlebar harness
43. Left turn signal switch
44. Lighting circuit breaker
45. Ignition circuit breaker
46. Accessories circuit breaker
47. Main circuit breaker
48. Emergency flasher
49. Emergency flasher switch
50. Handlebar clamp bolt

1978-1979 FX/FXE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KEY TO COLOR CODE
BK BLACK
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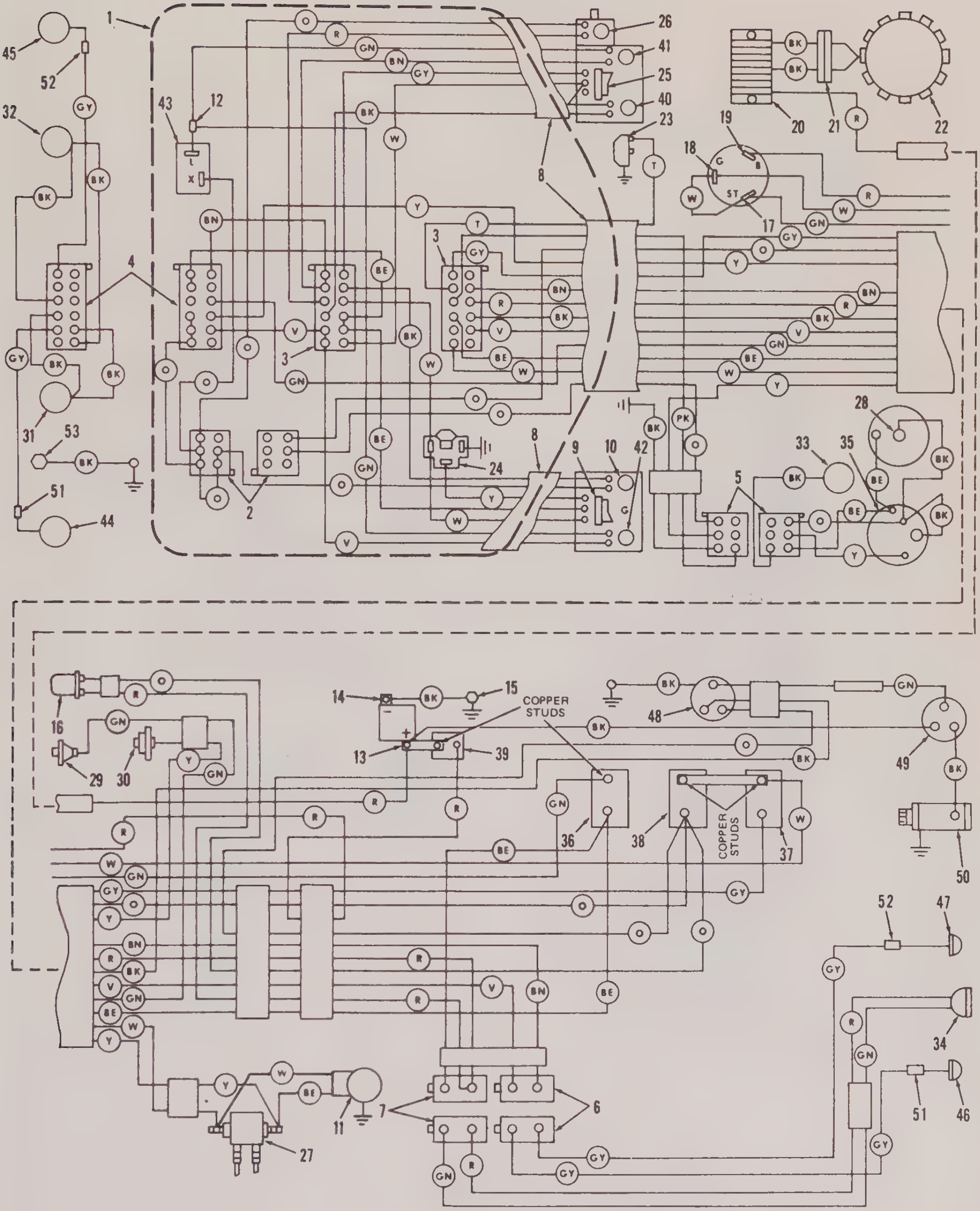
PK PINK

1978-1979 FX/FXE

1. Headlamp housing
2. Socket-plug combination
3. Socket-plug combination
4. Socket-plug combination
5. Wiring harness
6. Headlamp beam switch
7. Horn switch
8. Ignition timer
9. Wire connector
10. Battery positive terminal
11. Battery negative terminal
12. Frame lug bolt
13. Rear stoplight switch
14. Switch "ST" lights terminal
15. Switch "G" ignition terminal
16. Switch "B" battery terminal
17. Regulator—rectifier module
18. Alternator to module connector plug
19. Alternator stator
20. Horn
21. Headlamp socket
22. Engine stop switch
23. Front stoplight switch
24. Ignition coil
25. Main circuit breaker
26. Rear turn signal connector
27. Taillamp connector
28. Long stud on starter solenoid
29. Speedometer light
30. Oil pressure signal switch
31. Neutral switch
32. Neutral indicator light
33. Oil signal lamp
34. High beam indicator lamp
35. Tail and stoplight
36. Tachometer
39. Lighting circuit breaker
40. Ignition circuit breaker
41. Accessories circuit braeker
42. Starter switch
43. Right turn signal switch
44. Left turn signal switch
45. Turn signal flasher
46. Left front turn signal lamp
47. Right front turn signal lamp
48. Left rear turn signal lamp
49. Right rear turn signal lamp
50. Starter relay (FXE only)
51. Starter solenoid (FXE only)
52. Starter motor (FXE only)
53. Violet tag
54. Brown tag

1978-1979 FXS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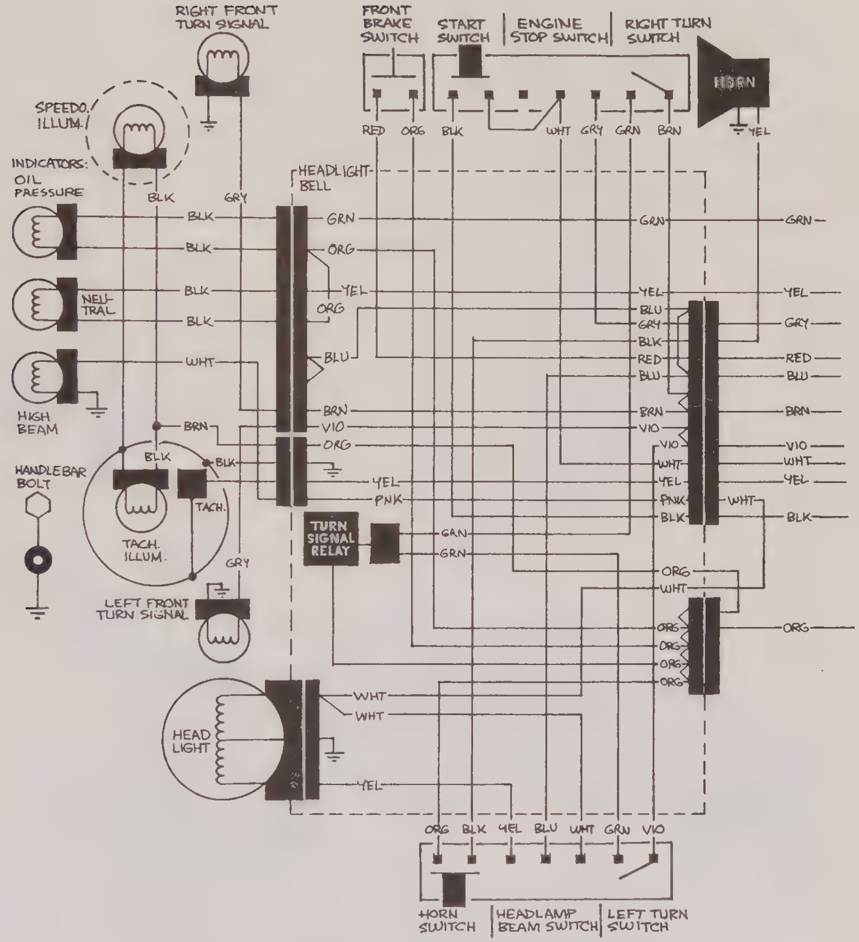
1978-1979 FXS

1. Headlamp housing
2. Socket-plug combination
3. Socket-plug combination
4. Socket-plug combination
5. Socket-plug combination
6. Socket-plug combination
7. Socket-plug combination
8. Wiring harness
9. Headlamp beam switch
10. Horn switch
11. Ignition timer
12. Wire connector
13. Battery positive terminal
14. Battery negative terminal
15. Frame lug bolt
16. Rear stoplight switch
17. Switch "ST" lights terminal
18. Switch "G" ignition terminal
19. Switch "B" battery terminal
20. Regulator-rectifier module
21. Alternator to module connector plug
22. Alternator stator
23. Horn
24. Headlamp socket
25. Engine stop switch
26. Front stoplight switch
27. Ignition coil
28. Speedometer light
29. Oil pressure switch
30. Neutral switch
31. Neutral indicator lamp
32. Oil signal lamp
33. High beam indicator lamp
34. Tail and stoplight
35. Tachometer
36. Lighting circuit breaker
37. Ignition circuit breaker
38. Accessories circuit breaker
39. Main circuit breaker
40. Starter switch
41. Right turn signal switch
42. Left turn signal switch
43. Turn signal flasher
44. Left front turn signal lamp
45. Right front turn signal lamp
46. Left rear turn signal lamp
47. Right rear turn signal lamp
48. Starter relay
49. Starter solenoid
50. Starter motor
51. Violet tag
52. Brown tag
53. Handlebar bolt

KEY TO COLOR CODE

BE = Blue
BK = Black
BN = Brown
GN = Green
GY = Gray
O = Orange
PK = Pink
R = Red
V = Violet
W = White
Y = Yellow
TN = Tan

1980-1984 FXS/FXEF/FXB


RIGHT FRONT TURN SIGNAL
FRONT BRAKE SWITCH
START SWITCH
ENGINE STOP SWITCH
RIGHT TURN SWITCH
HORN
RED
ORG
BLK
WHT
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GRN
BRN
YEL
SPEEDO. ILLUM.
INDICATORS:
OIL PRESSURE
NEUTRAL
HIGH BEAM
HEADLIGHT BELL
HANDLEBAR BOLT
TACH. ILLUM.
TACH.
LEFT FRONT TURN SIGNAL
TURN SIGNAL RELAY
HEAD LIGHT
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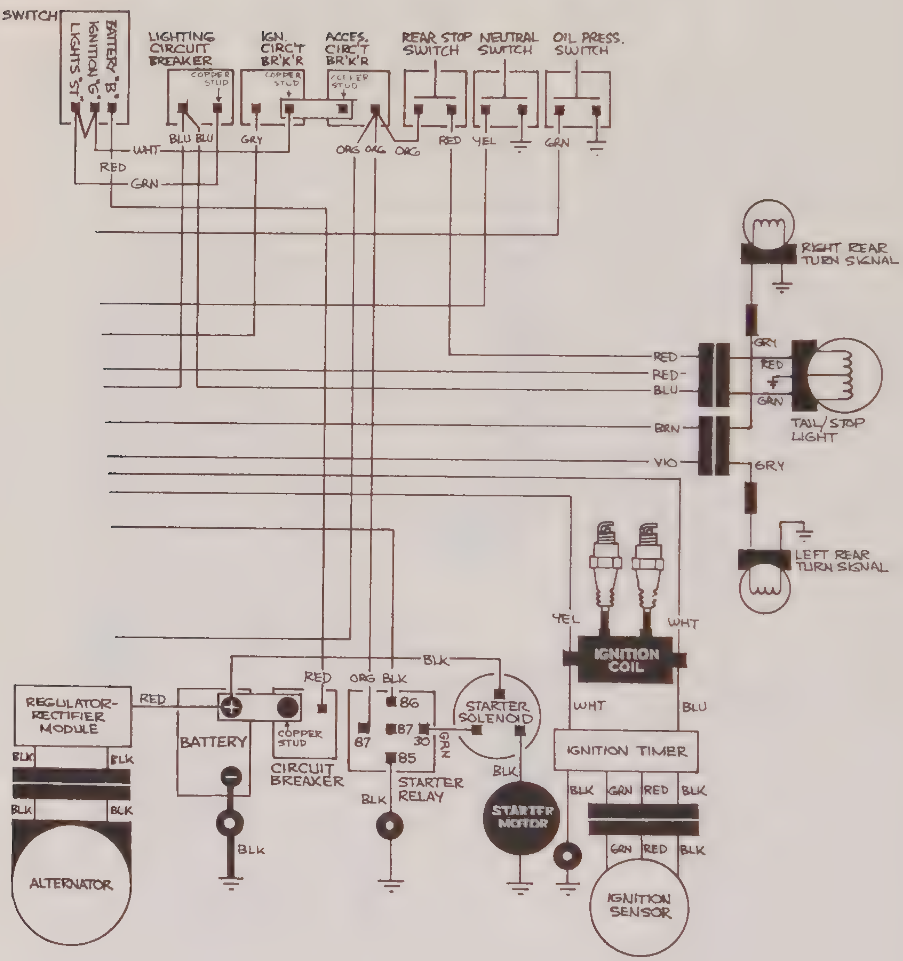
HORN SWITCH
HEADLAMP BEAM SWITCH
LEFT TURN SWITCH

1980-1984 FXS/FXEF/FXB


SWITCH
LIGHTS "ST"
IGNITION "G"
BATTERY "B"
LIGHTING CIRCUIT BREAKER
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COPPER STUD
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COPPER STUD
REAR STOP SWITCH
NEUTRAL SWITCH
OIL PRESS. SWITCH
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RIGHT REAR TURN SIGNAL
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STARTER MOTOR
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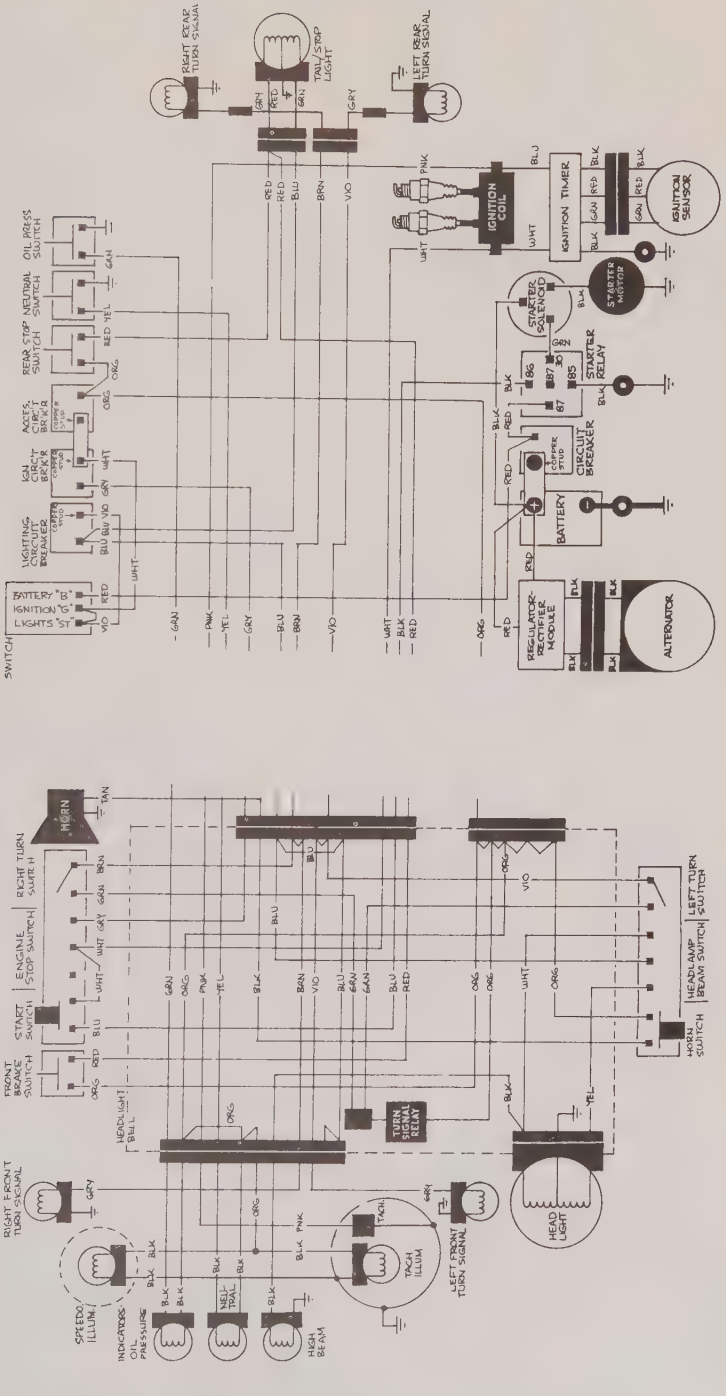
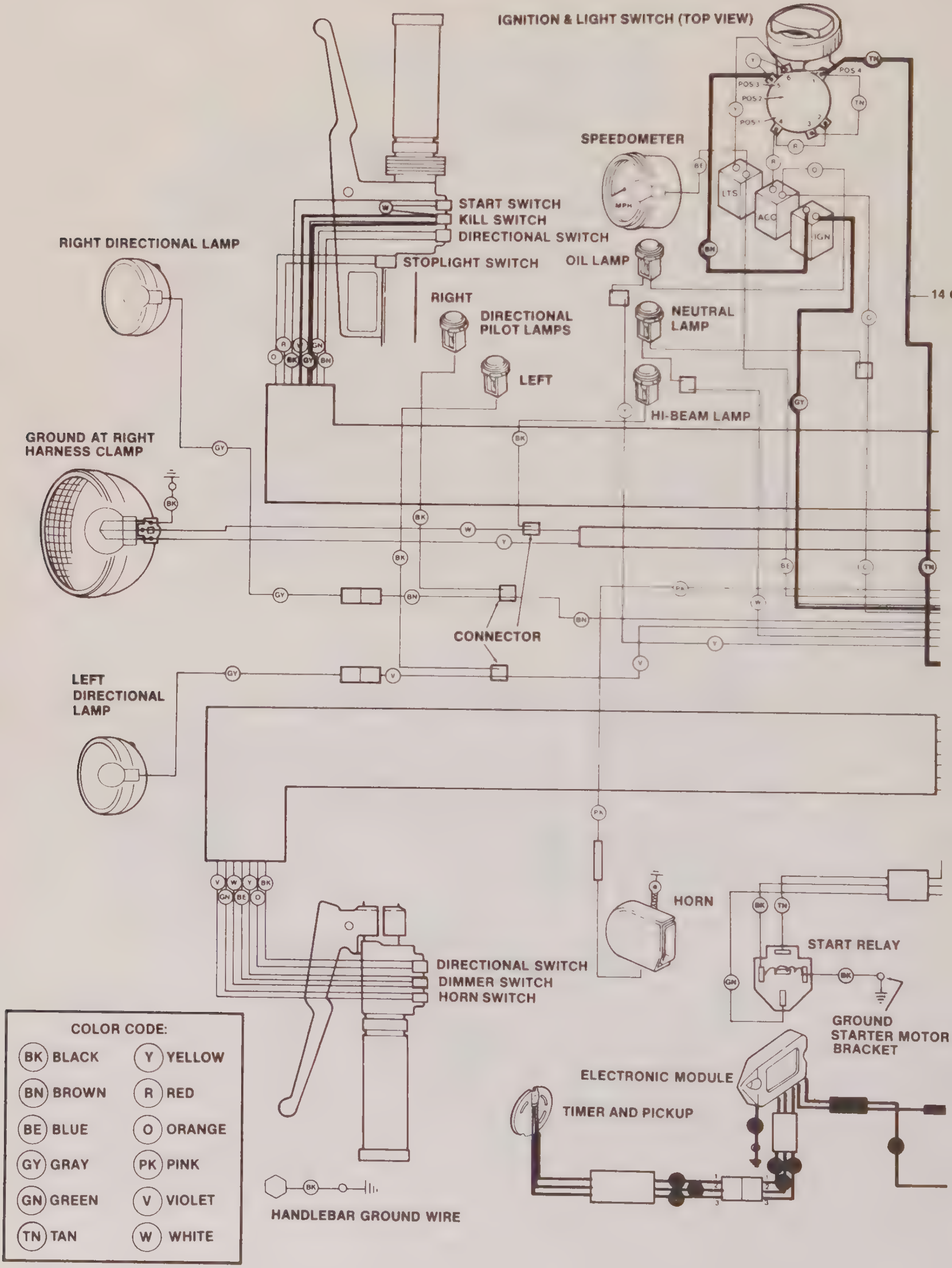
ALTERNATOR

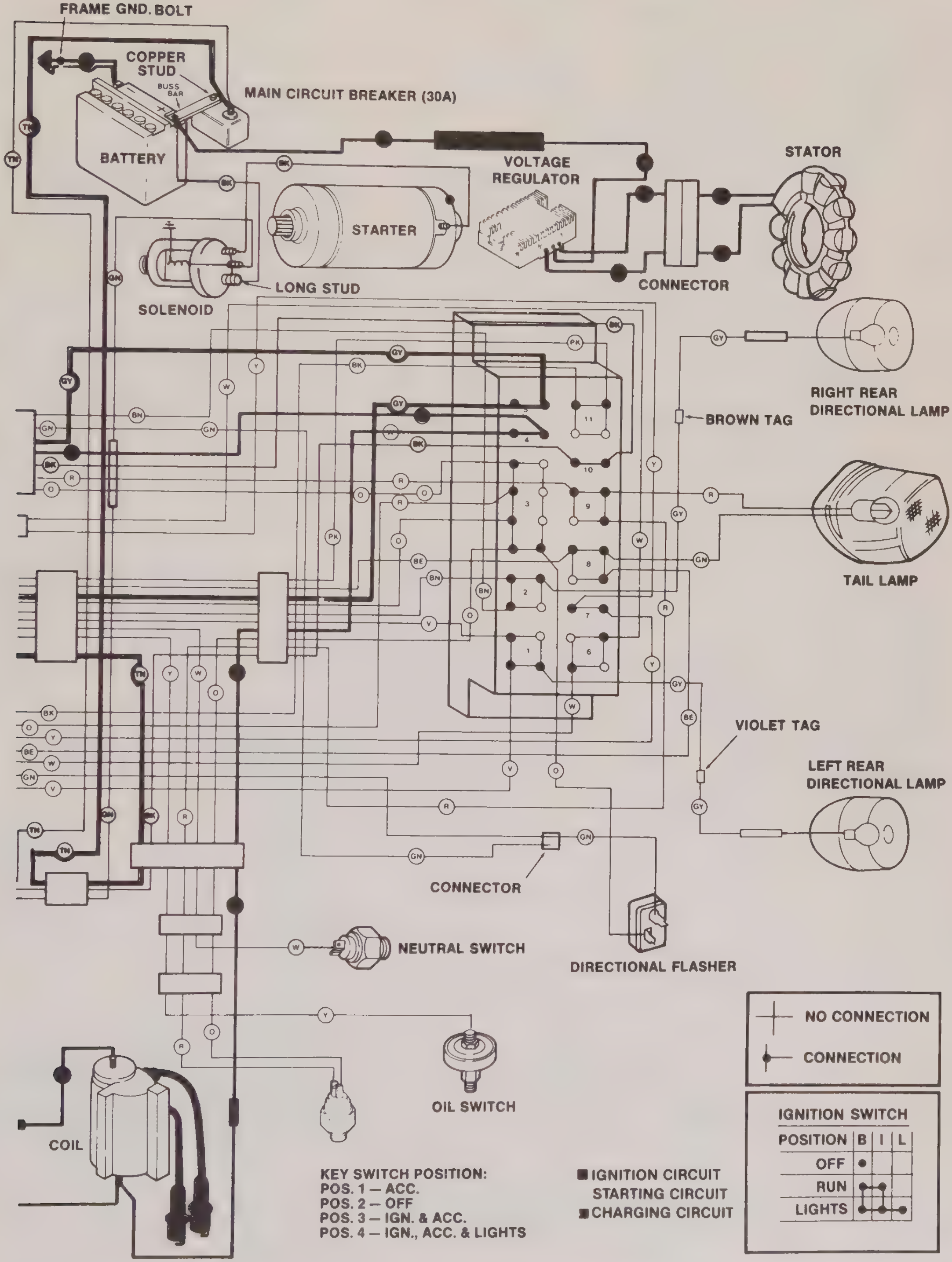
1980-1982 FXE


RIGHT REAR TURN SIGNAL
TAIL/STOP LIGHT
LEFT REAR TURN SIGNAL
GRY
RED
GRN
BLU
BRN
VIO
PNK
BLK
WHT
YEL
ORG
TAN
IGNITION COIL
IGNITION TIMER
IGNITION SENSOR
STARTER SOLENOID
STARTER MOTOR
STARTER RELAY
86
87
30
85
CIRCUIT BREAKER
COPPER STUD
BATTERY
REGULATOR-RECTIFIER MODULE
ALTERNATOR
OIL PRESS SWITCH
NEUTRAL SWITCH
REAR STOP SWITCH
ACCES. CIRC'T BR'K'R
IGN CIRC'T BR'K'R
LIGHTING CIRCUIT BREAKER
SWITCH
BATTERY "B"
IGNITION "G"
LIGHTS "ST"
HORN
RIGHT TURN SWITCH
ENGINE STOP SWITCH
START SWITCH
FRONT BRAKE SWITCH
HEADLIGHT BELL
TURN SIGNAL RELAY
LEFT TURN SWITCH
HEADLAMP BEAM SWITCH
HORN SWITCH
HEAD LIGHT
RIGHT FRONT TURN SIGNAL
LEFT FRONT TURN SIGNAL
SPEEDO ILLUM.
TACH.
TACH ILLUM
INDICATORS: OIL PRESSURE
NEUTRAL
HIGH BEAM

1980-1984 FXWG
(PART 1)


IGNITION & LIGHT SWITCH (TOP VIEW)
POS 4
POS 3
POS 2
POS 1
SPEEDOMETER
MPH
LTS
ACC
IGN
START SWITCH
KILL SWITCH
DIRECTIONAL SWITCH
STOPLIGHT SWITCH
OIL LAMP
RIGHT DIRECTIONAL LAMP
RIGHT
DIRECTIONAL
PILOT LAMPS
LEFT
NEUTRAL
LAMP
HI-BEAM LAMP
14 GA.
GROUND AT RIGHT
HARNESS CLAMP
CONNECTOR
LEFT
DIRECTIONAL
LAMP
HORN
START RELAY
GROUND
STARTER MOTOR
BRACKET
DIRECTIONAL SWITCH
DIMMER SWITCH
HORN SWITCH
ELECTRONIC MODULE
TIMER AND PICKUP
HANDLEBAR GROUND WIRE
COLOR CODE:
BK BLACK
Y YELLOW
BN BROWN
R RED
BE BLUE
O ORANGE
GY GRAY
PK PINK
GN GREEN
V VIOLET
TN TAN
W WHITE

1980-1984 FXWG (PART 2)


FRAME GND. BOLT
COPPER STUD
BUSS BAR
MAIN CIRCUIT BREAKER (30A)
BATTERY
VOLTAGE REGULATOR
STATOR
STARTER
SOLENOID
LONG STUD
CONNECTOR
RIGHT REAR DIRECTIONAL LAMP
BROWN TAG
TAIL LAMP
VIOLET TAG
LEFT REAR DIRECTIONAL LAMP
CONNECTOR
NEUTRAL SWITCH
DIRECTIONAL FLASHER
OIL SWITCH
COIL

KEY SWITCH POSITION:
POS. 1 — ACC.
POS. 2 — OFF
POS. 3 — IGN. & ACC.
POS. 4 — IGN., ACC. & LIGHTS

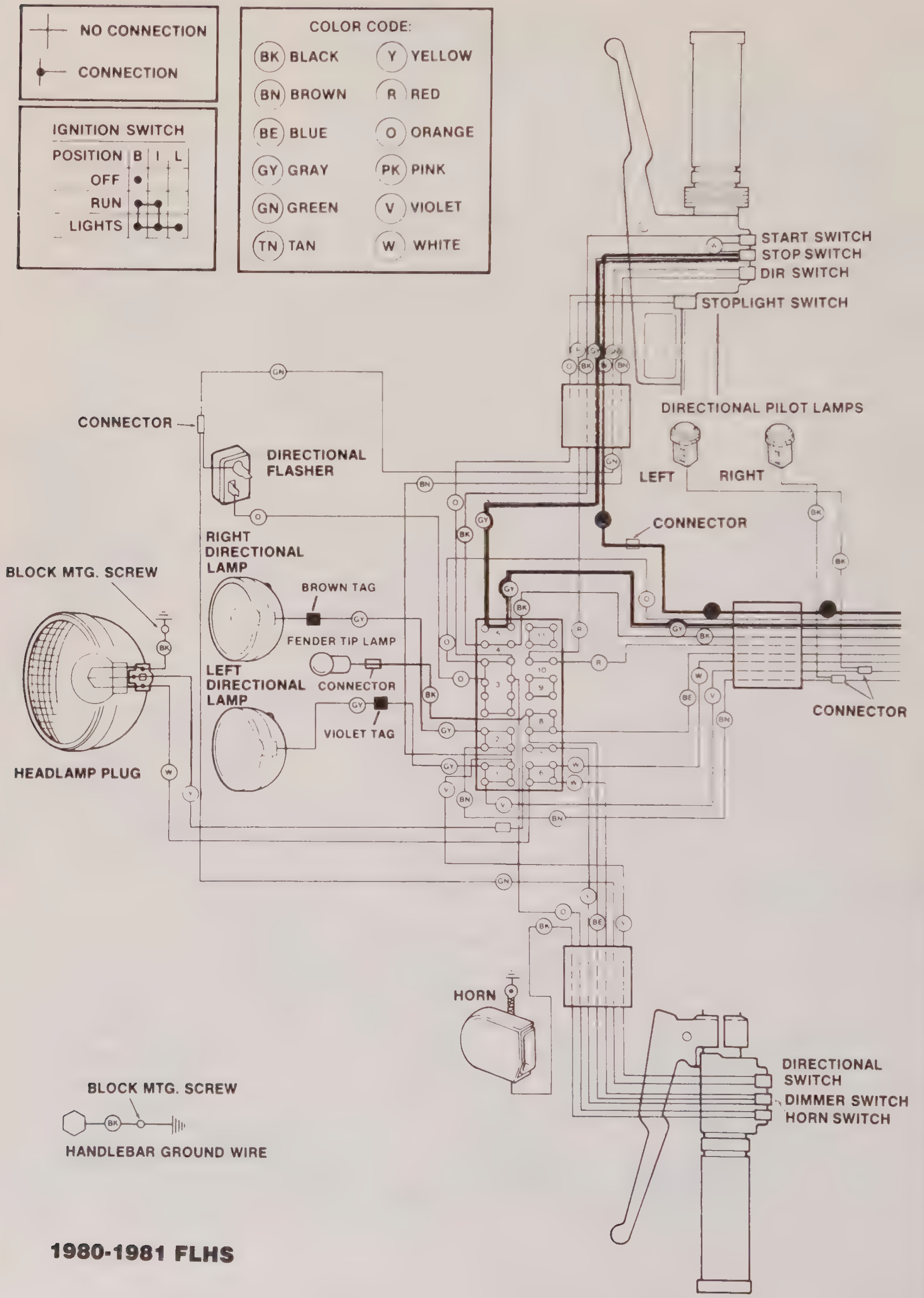
■ IGNITION CIRCUIT
STARTING CIRCUIT
■ CHARGING CIRCUIT

NO CONNECTION

CONNECTION

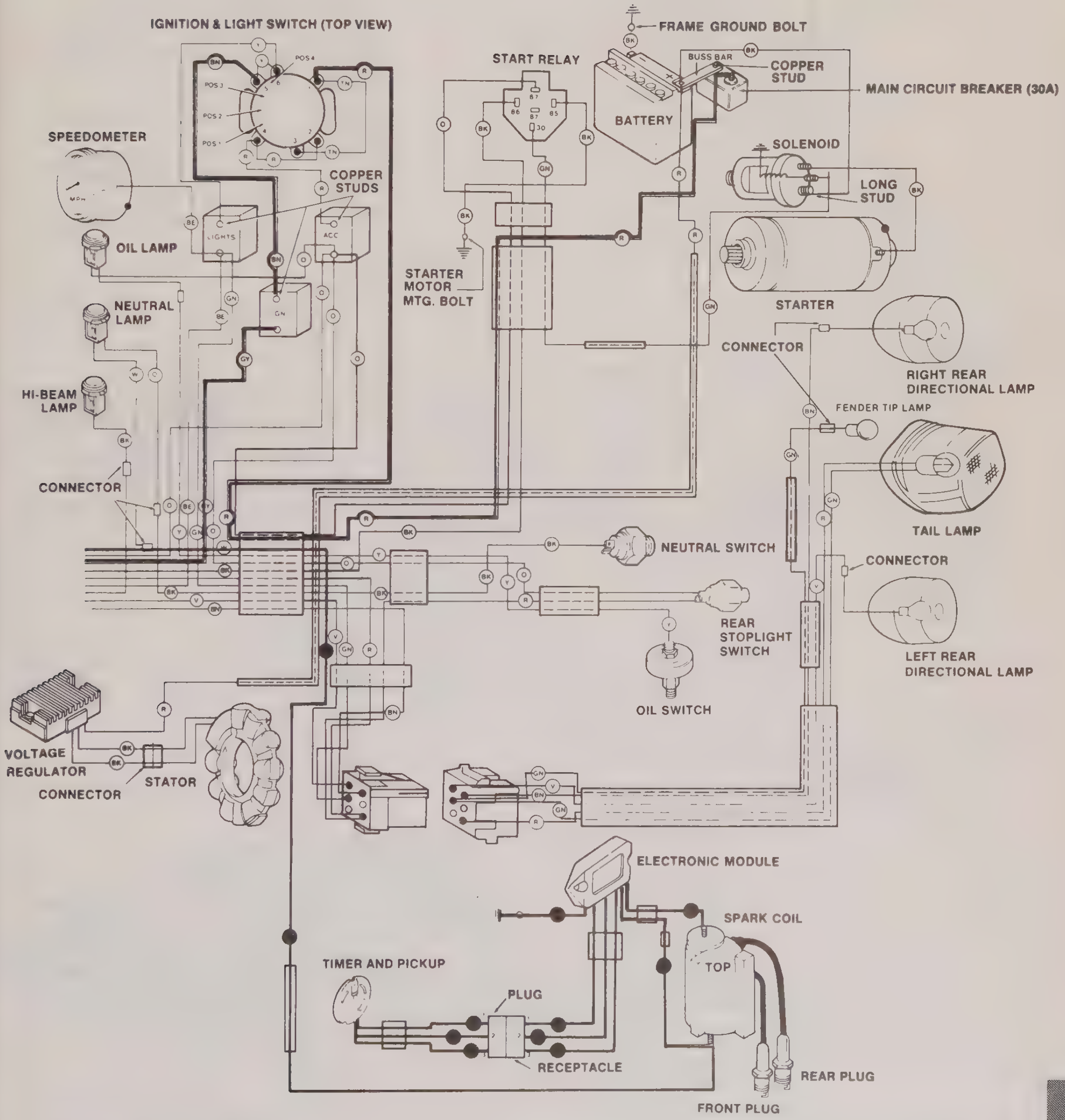
IGNITION SWITCH

POSITION	B	I	L
OFF	●		
RUN	●	●	
LIGHTS	●	●	●

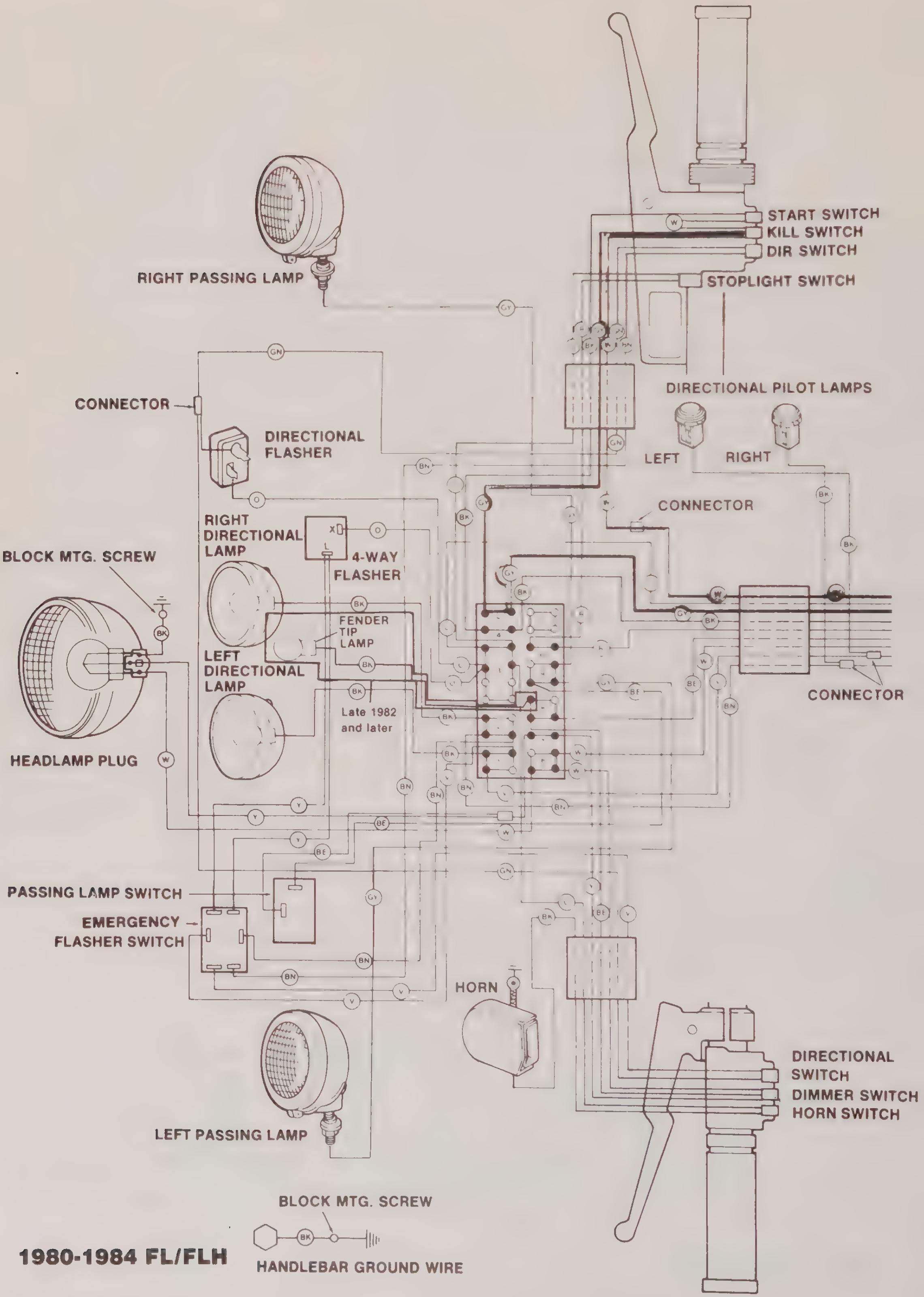

NO CONNECTION
CONNECTION
IGNITION SWITCH
POSITION B I L
OFF
RUN
LIGHTS
COLOR CODE:
BK BLACK
Y YELLOW
BN BROWN
R RED
BE BLUE
O ORANGE
GY GRAY
PK PINK
GN GREEN
V VIOLET
TN TAN
W WHITE
START SWITCH
STOP SWITCH
DIR SWITCH
STOPLIGHT SWITCH
DIRECTIONAL PILOT LAMPS
LEFT
RIGHT
CONNECTOR
DIRECTIONAL FLASHER
RIGHT DIRECTIONAL LAMP
BROWN TAG
FENDER TIP LAMP
CONNECTOR
LEFT DIRECTIONAL LAMP
VIOLET TAG
BLOCK MTG. SCREW
HEADLAMP PLUG
CONNECTOR
HORN
DIRECTIONAL SWITCH
DIMMER SWITCH
HORN SWITCH
BLOCK MTG. SCREW
HANDLEBAR GROUND WIRE

1980-1981 FLHS

KEY SWITCH POSITION:
POS. 1 — ACC.
POS. 2 — OFF
POS. 3 — IGN. & ACC.
POS. 4 — IGN., ACC. & LIGHTS

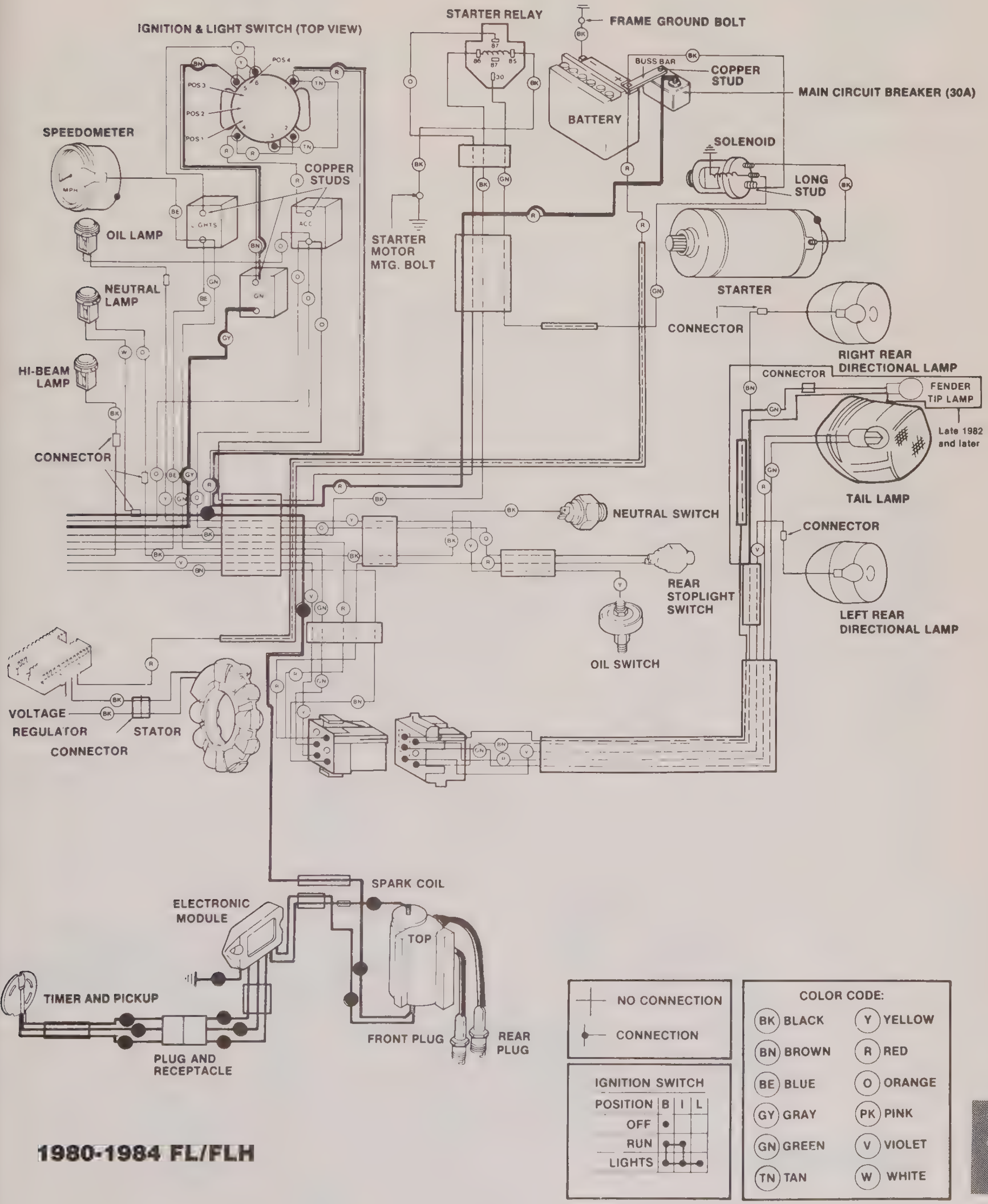

IGNITION & LIGHT SWITCH (TOP VIEW)
POS 4
POS 3
POS 2
POS 1
SPEEDOMETER
COPPER STUDS
LIGHTS
ACC
OIL LAMP
NEUTRAL LAMP
HI-BEAM LAMP
CONNECTOR
FRAME GROUND BOLT
START RELAY
BUSS BAR
COPPER STUD
MAIN CIRCUIT BREAKER (30A)
BATTERY
SOLENOID
LONG STUD
STARTER MOTOR MTG. BOLT
STARTER
CONNECTOR
RIGHT REAR DIRECTIONAL LAMP
FENDER TIP LAMP
TAIL LAMP
NEUTRAL SWITCH
CONNECTOR
REAR STOPLIGHT SWITCH
LEFT REAR DIRECTIONAL LAMP
OIL SWITCH
VOLTAGE REGULATOR
CONNECTOR
STATOR
ELECTRONIC MODULE
SPARK COIL
TOP
TIMER AND PICKUP
PLUG
RECEPTACLE
REAR PLUG
FRONT PLUG

1980-1981 FLHS


START SWITCH
KILL SWITCH
DIR SWITCH
STOPLIGHT SWITCH
RIGHT PASSING LAMP
DIRECTIONAL PILOT LAMPS
LEFT
RIGHT
CONNECTOR
DIRECTIONAL FLASHER
CONNECTOR
RIGHT DIRECTIONAL LAMP
4-WAY FLASHER
BLOCK MTG. SCREW
FENDER TIP LAMP
LEFT DIRECTIONAL LAMP
Late 1982 and later
CONNECTOR
HEADLAMP PLUG
PASSING LAMP SWITCH
EMERGENCY FLASHER SWITCH
HORN
DIRECTIONAL SWITCH
DIMMER SWITCH
HORN SWITCH
LEFT PASSING LAMP
BLOCK MTG. SCREW
HANDLEBAR GROUND WIRE
GY
GN
W
O
BK
BN
Y
BE
V

1980-1984 FL/FLH

KEY SWITCH POSITION:
POS. 1 – ACC.
POS. 2 – OFF
POS. 3 – IGN. & ACC.
POS. 4 – IGN., ACC. & LIGHTS


STARTER RELAY
FRAME GROUND BOLT
IGNITION & LIGHT SWITCH (TOP VIEW)
BUSS BAR
COPPER STUD
MAIN CIRCUIT BREAKER (30A)
BATTERY
SPEEDOMETER
MPH
SOLENOID
COPPER STUDS
LONG STUD
OIL LAMP
STARTER MOTOR MTG. BOLT
NEUTRAL LAMP
STARTER
CONNECTOR
HI-BEAM LAMP
RIGHT REAR DIRECTIONAL LAMP
CONNECTOR
FENDER TIP LAMP
Late 1982 and later
CONNECTOR
TAIL LAMP
NEUTRAL SWITCH
CONNECTOR
REAR STOPLIGHT SWITCH
LEFT REAR DIRECTIONAL LAMP
OIL SWITCH
VOLTAGE REGULATOR
STATOR
CONNECTOR
SPARK COIL
ELECTRONIC MODULE
TOP
TIMER AND PICKUP
FRONT PLUG
REAR PLUG
PLUG AND RECEPTACLE

NO CONNECTION

CONNECTION

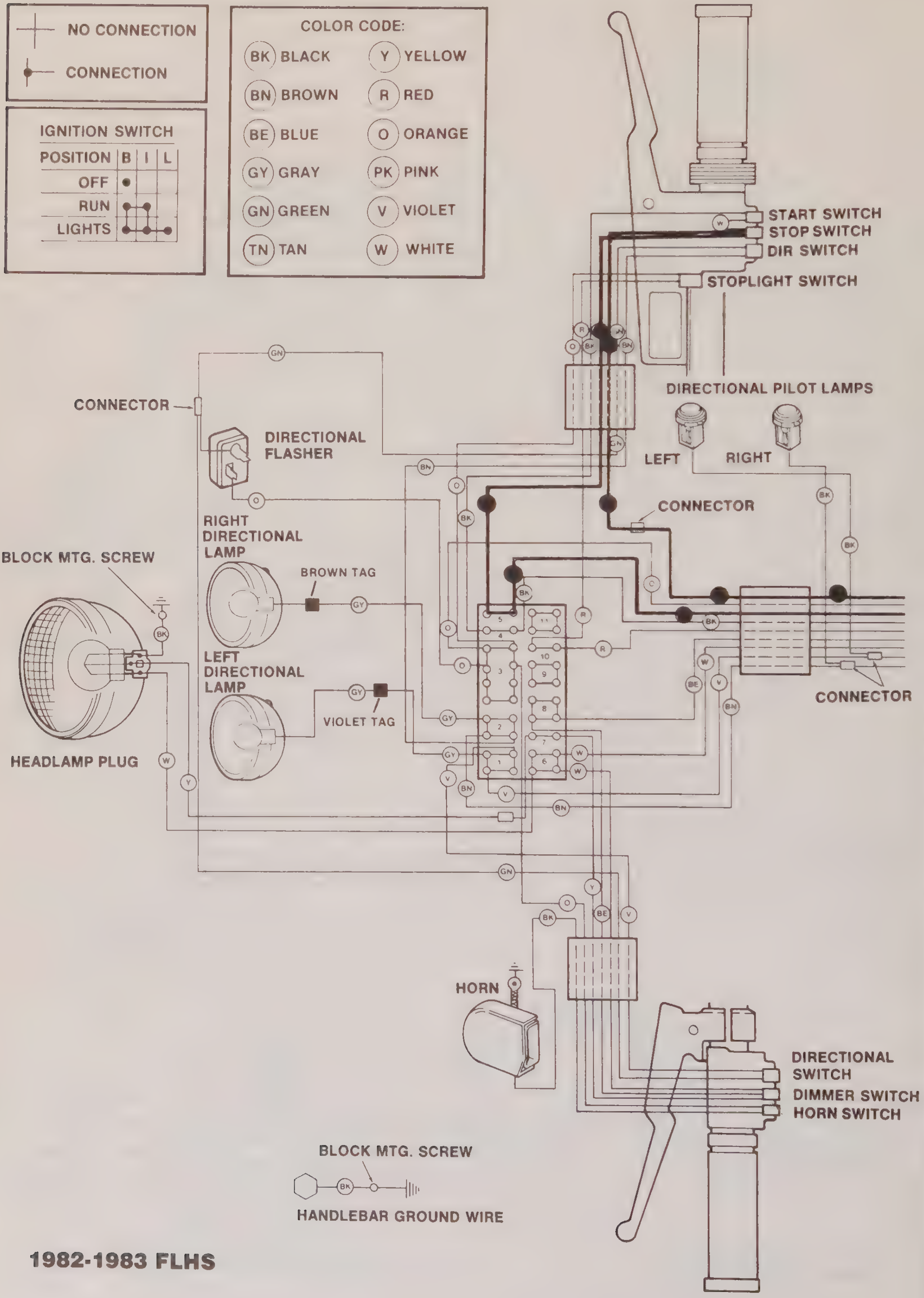
IGNITION SWITCH

POSITION	B	I	L
OFF	●		
RUN	●	●	
LIGHTS	●	●	●

COLOR CODE:

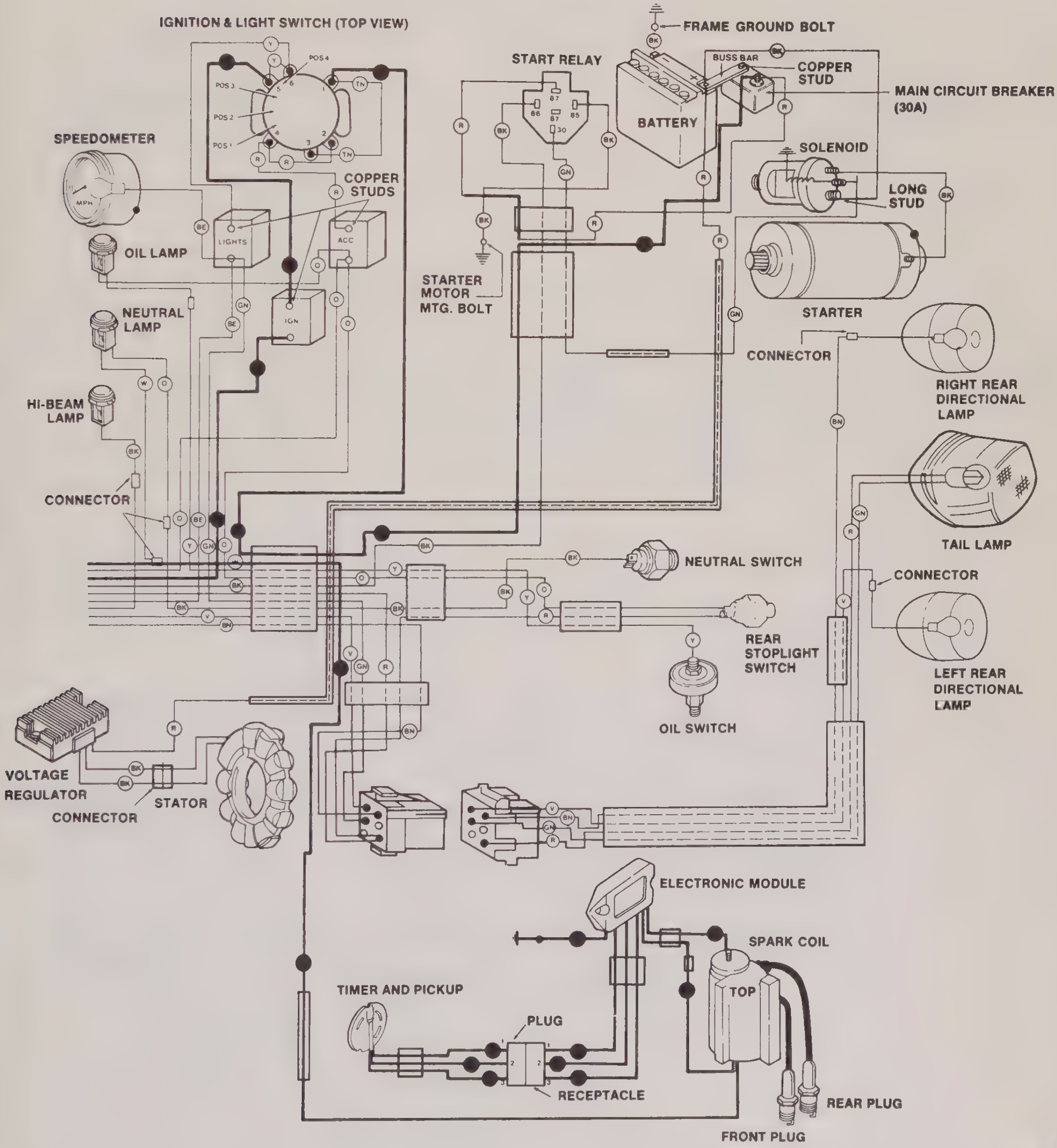
BK	BLACK	Y	YELLOW
BN	BROWN	R	RED
BE	BLUE	O	ORANGE
GY	GRAY	PK	PINK
GN	GREEN	V	VIOLET
TN	TAN	W	WHITE

1980-1984 FL/FLH

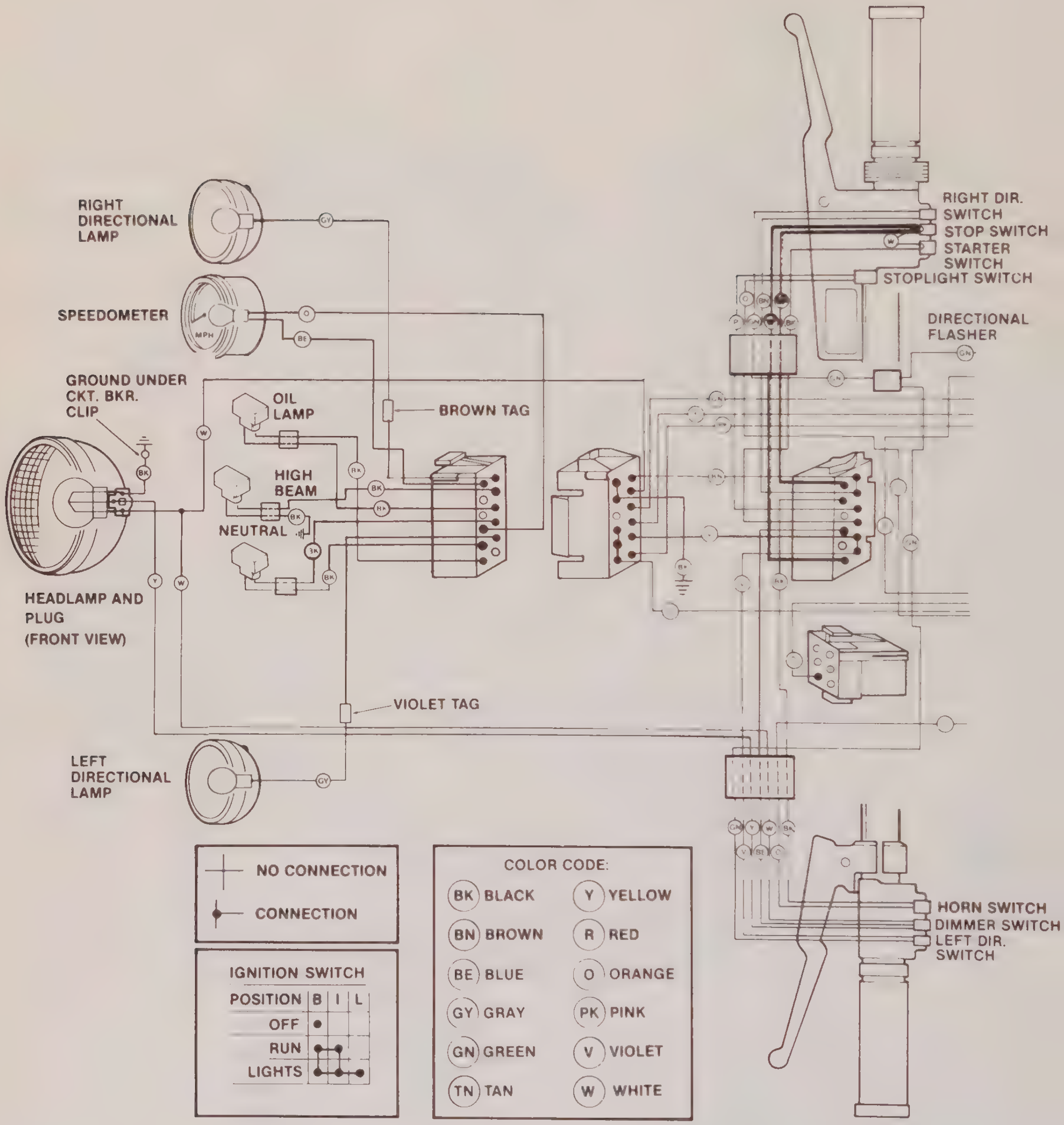

NO CONNECTION
CONNECTION
IGNITION SWITCH
POSITION B I L
OFF
RUN
LIGHTS
COLOR CODE:
BK BLACK
BN BROWN
BE BLUE
GY GRAY
GN GREEN
TN TAN
Y YELLOW
R RED
O ORANGE
PK PINK
V VIOLET
W WHITE
START SWITCH
STOP SWITCH
DIR SWITCH
STOPLIGHT SWITCH
DIRECTIONAL PILOT LAMPS
LEFT
RIGHT
CONNECTOR
DIRECTIONAL FLASHER
RIGHT DIRECTIONAL LAMP
BROWN TAG
LEFT DIRECTIONAL LAMP
VIOLET TAG
BLOCK MTG. SCREW
HEADLAMP PLUG
CONNECTOR
CONNECTOR
HORN
DIRECTIONAL SWITCH
DIMMER SWITCH
HORN SWITCH
BLOCK MTG. SCREW
HANDLEBAR GROUND WIRE

1982-1983 FLHS

KEY SWITCH POSITION:
POS. 1 — ACC.
POS. 2 — OFF
POS. 3 — IGN. & ACC.
POS. 4 — IGN., ACC. & LIGHTS


IGNITION & LIGHT SWITCH (TOP VIEW)
POS 4
POS 3
POS 2
POS 1
FRAME GROUND BOLT
START RELAY
BUSS BAR
COPPER STUD
MAIN CIRCUIT BREAKER (30A)
BATTERY
SPEEDOMETER
MPH
COPPER STUDS
LIGHTS
ACC
IGN
SOLENOID
LONG STUD
OIL LAMP
STARTER MOTOR MTG. BOLT
STARTER
NEUTRAL LAMP
CONNECTOR
RIGHT REAR DIRECTIONAL LAMP
HI-BEAM LAMP
CONNECTOR
TAIL LAMP
NEUTRAL SWITCH
CONNECTOR
REAR STOPLIGHT SWITCH
LEFT REAR DIRECTIONAL LAMP
OIL SWITCH
VOLTAGE REGULATOR
STATOR
CONNECTOR
ELECTRONIC MODULE
SPARK COIL
TIMER AND PICKUP
TOP
PLUG
RECEPTACLE
REAR PLUG
FRONT PLUG

1982-1983 FLHS


RIGHT DIRECTIONAL LAMP
SPEEDOMETER
MPH
GROUND UNDER CKT. BKR. CLIP
OIL LAMP
HIGH BEAM
NEUTRAL
BROWN TAG
HEADLAMP AND PLUG (FRONT VIEW)
VIOLET TAG
LEFT DIRECTIONAL LAMP
RIGHT DIR. SWITCH
STOP SWITCH
STARTER SWITCH
STOPLIGHT SWITCH
DIRECTIONAL FLASHER
HORN SWITCH
DIMMER SWITCH
LEFT DIR. SWITCH
GY
O
BE
W
BK
R
Y
GN
BN
V

NO CONNECTION

CONNECTION

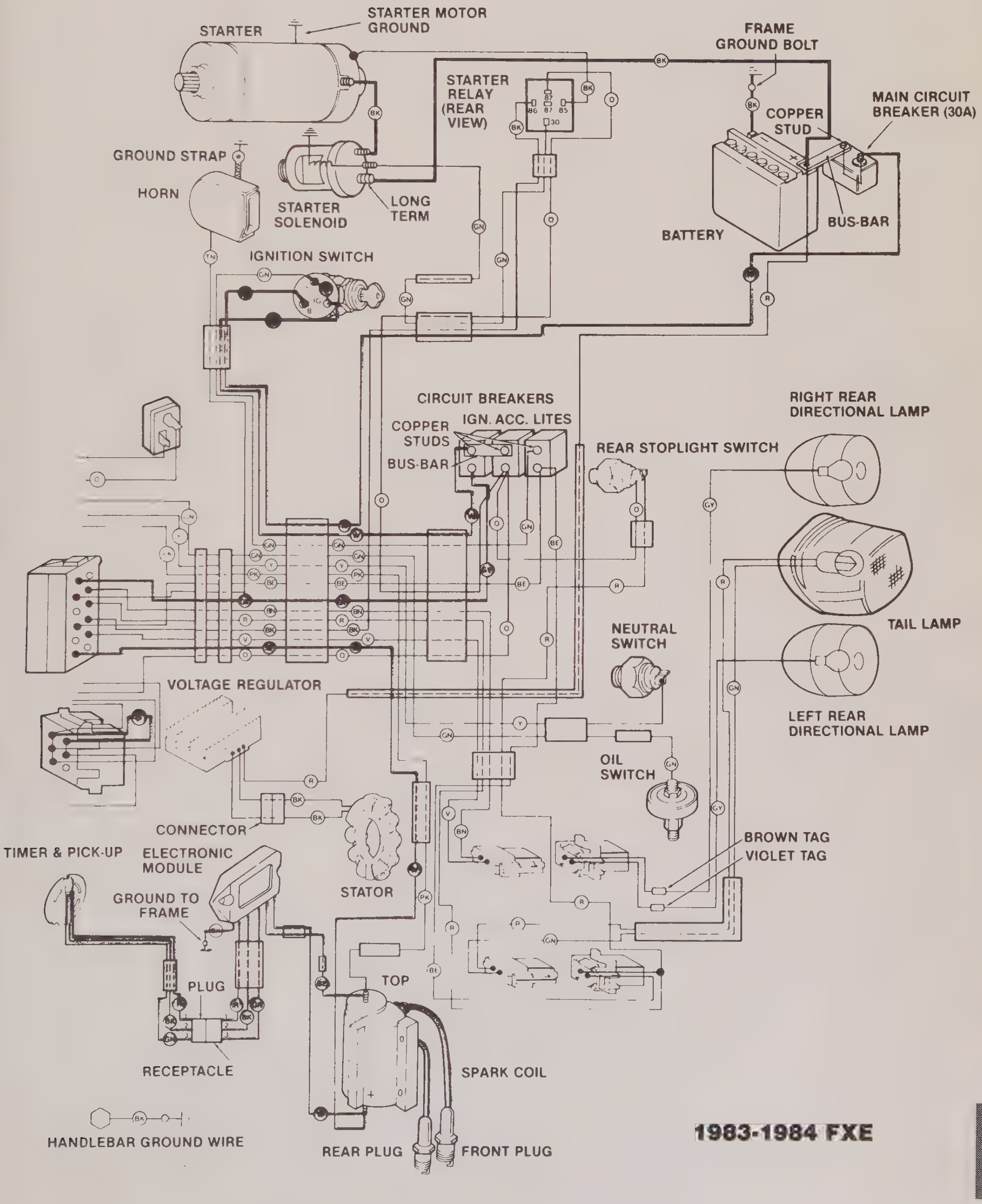
IGNITION SWITCH

POSITION	B	I	L
OFF	●		
RUN	●	●	
LIGHTS	●	●	●

COLOR CODE:

BK	BLACK	Y	YELLOW
BN	BROWN	R	RED
BE	BLUE	O	ORANGE
GY	GRAY	PK	PINK
GN	GREEN	V	VIOLET
TN	TAN	W	WHITE

1983-1984 FXE


STARTER
STARTER MOTOR GROUND
FRAME GROUND BOLT
STARTER RELAY (REAR VIEW)
MAIN CIRCUIT BREAKER (30A)
COPPER STUD
GROUND STRAP
HORN
STARTER SOLENOID
LONG TERM
BUS-BAR
BATTERY
IGNITION SWITCH
CIRCUIT BREAKERS
IGN. ACC. LITES
COPPER STUDS
BUS-BAR
RIGHT REAR DIRECTIONAL LAMP
REAR STOPLIGHT SWITCH
NEUTRAL SWITCH
TAIL LAMP
VOLTAGE REGULATOR
LEFT REAR DIRECTIONAL LAMP
OIL SWITCH
CONNECTOR
TIMER & PICK-UP
ELECTRONIC MODULE
GROUND TO FRAME
STATOR
BROWN TAG
VIOLET TAG
PLUG
TOP
RECEPTACLE
SPARK COIL
HANDLEBAR GROUND WIRE
REAR PLUG
FRONT PLUG

1983-1984 FXE

NOTES

NOTES

NOTES

HARLEY-DAVIDSON

74 & 80 4-SPEED V-TWINS • 1959-1984

SERVICE • REPAIR • PERFORMANCE

FL
FXE
FLH
FXEF
FXB
FLHS
FXS
FXSB
FX
FXWG

This easy-to-use manual can save you hundreds of dollars in maintenance and repair bills. Step-by-step procedures and detailed illustrations guide you through every job. Inside, you'll find:

Quick Reference Data
The specifications you need most often—on specially marked pages.

General Information
Tools, techniques and shop safety.

Periodic Maintenance
All the tasks required by your Harley's warranty.

Engine
Complete overhaul procedures for your Harley.

Primary Drive, Clutch and Transmission
Foot and hand clutch control adjustment; clutch booster adjustment; electric and kickstarter overhaul; transmission overhaul.

Carburetors
Carburetor overhaul and adjustment; troubleshooting procedures.

Electrical System
Testing, adjustment and replacement procedures for starting, charging, and ignition systems.

Chassis
Fork overhaul; shock absorber replacement; fork stem and bracket overhaul; tire, wheel and hub maintenance; swing arm maintenance; brake lining replacement, hydraulic components overhaul; drive chain and drive belt maintenance.

Troubleshooting
Easy-to-follow text guides you from symptoms to causes.

Performance
What performance improvements will and won't do for your Harley.

Index
Reference and cross-reference to all components.

Wiring Diagrams
Complete schematics for your Harley.

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